CHAPTER 6

SAFETY MANAGEMENT PROGRAMS

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6. SAFETY MANAGEMENT PROGRAMS

This chapter summarizes the Safety Management Programs (SMPs) that comprise the safety infrastructure at the Rocky Flats Environmental Technology Site (Site or RFETS). This chapter, also, provides information to assist the reader in understanding the various SMPs, unique aspects of each program, and program interrelationships that affect the authorization of specific Site activities and operations. These programs implement various Department of Energy (DOE) orders and Federal, State, and local regulations. They also ensure operations and activities are performed in a responsible manner with regard to human health and safety and environmental protection. Implementation of the SMPs requires a personal commitment. With a strong sense of ownership of the SMPs, each employee ensures their own personal health and safety. This is the desired Site culture, starting with senior management's commitment to safety and health and extending to all employees.

6.1 INTRODUCTION

The SMPs provide formal and disciplined methods of conducting business and operations while minimizing the potential for harm to the workers, public, and environment. The SMPs address three major areas: (1) appropriate control of radiological and hazardous material hazards, (2) regulatory compliance with Federal and State requirements, codes and standards, and standard industrial health and safety practices, and (3) good engineering and management practices. Each SMP section provides a brief summary description of the program and then addresses the Authorization Basis (AB) significance of the program. A comprehensive description and the specific requirements of the programs are found in the referenced program manuals or other references cited herein, which govern implementation of the SMPs.

It is not the intent of this chapter to describe the detail of each SMP. It rather brings together the basic elements of the various SMPs and shows how they are interrelated in a manner which contributes to the overall safety at the Site and specifically to Nuclear Safety hazards and accident analyses. These descriptions are included in the *Rocky Flats Environmental Technology Site Safety Analysis Report* (Site SAR) to indicate the prominence of these programs and provide a consistent description that can be more easily maintained. The SMPs address the following disciplines.

- Conduct of Operations
- Configuration Management
- Criticality Safety
- Document Management
- Emergency Preparedness
- Engineering
- Environmental Management
- Fire Protection
- Integrated Work Control

- Nuclear Safety
- Occupational Safety and Industrial Hygiene
- Quality Assurance
- Radiological Protection
- Testing, Surveillance, and Maintenance
- Training
- Transportation Safety
- Waste Management

The SMPs described in this chapter provide the infrastructure to meet the requirements of the Integrated Safety Management (ISM) philosophy as it is applied to all work activities at the Site. The primary objective of ISM is to perform work safely (i.e., protection of the workers, public, and environment is a fundamental part of work planning and execution processes). The Integrated Work Control Program (IWCP) implements ISM at the Site. The Site's commitment to the SMPs supports the following seven guiding principles of ISM.

(1) Line management is responsible for the protection of the workers, public, and environment, and is responsible for establishing the atmosphere to accomplish work safely.

(2) Clear and unambiguous lines of authority and responsibility for ensuring safety are established and maintained at organizational levels within Kaiser-Hill Company, L.L.C. (K-H) and its subcontractors.

(3) Personnel possess the experience, knowledge, skills, and abilities that are necessary to safely discharge their responsibilities.

(4) Resources are effectively allocated to address safety, programmatic, and operational considerations as a priority whenever activities are planned and performed.

(5) Before work is performed, the associated hazards are evaluated and an agreed-upon set of safety standards and requirements are established which, if properly implemented, provide adequate assurance that the public, workers, and environment are protected from adverse consequences.

(6) Administrative and engineering controls to prevent and mitigate hazards are tailored to the hazards presented by the work being performed.

(7) Conditions and requirements to initiate and conduct operations are clearly established and agreed-upon.

Site Safety Culture

An important underlying assumption of AB accident analyses is that safety (i.e., protection of the workers and public) is the highest priority for the overall Site management structure. In other words, safety is considered first and all the Site Projects, organizations, and facilities work effectively together to ensure safety comes first in order to accomplish scheduled goals. At the Site, the safety culture is guaranteed by a strong line management structure. All Site Projects are responsible for safety and include safety expertise within their immediate organization. Criticality safety and waste management expertise is matrixed to each Site Project from the Engineering, Environmental, Safety, and Quality Programs (EES&QP) and Material Stewardship and Off-Site Shipments (MS) Projects, respectively. The Site infrastructure provides additional support and oversight from the EES&QP Department, which includes most of the SMP Owners with support staff.

The Site is organized into six major closure projects (collectively referred to as Site Projects) and four support groups. The Site Projects are managed by K-H and staffed with a combination of K-H and subcontractor personnel. Most SMPs are administered through support groups, but implementation is the responsibility of the Site Projects. The six major closure projects are (1) Building 371/374, (2) Building 707, (3) Building 771, (4) Building 776/777, (5) MS, and (6) Remediation, Industrial Building Decommissioning and Demolition, and Site Services (RISS). Building 371/374 is responsible for consolidation of remaining residue and special nuclear material (SNM) operations into Building 371, enabling the protected area to be shrunk around the facility. Buildings 707, 771, and 776/777 are in various stages of decontamination and decommissioning (D&D).

The MS Project is responsible for all material and waste characterization (including analytical services), packaging, interim storage, and shipping. Included within the MS Project are all the waste management and characterization facilities and the Traffic and Transportation Department. The MS Project's mission is to streamline and accelerate waste and SNM shipment, in a manner that ensures safety, compliance, and cost-efficiency. Also, the MS Project is responsible for maintaining the Site SAR.

The mission of the RISS Project is to safely perform environmental characterization and remediation of the Site in accordance with the *Rocky Flats Cleanup Agreement* (RFCA), decommission all office, industrial and south side buildings, and provide cost-effective Site services in support of the overall closure mission. The RISS Project maintains landlord function for all buildings except the four major plutonium buildings and buildings that are part of the MS Project. The RISS Project maintains the Site infrastructure systems' operations such as steam, electrical, and water and Site safety management support such as emergency preparedness.

The support groups Administration; General Counsel and Audit; EES&QP; and Strategic Planning and Integration (SP&I) support the Site Projects with matters within their areas of expertise. Administration provides finance, human resource, labor

relations, and subcontracts management support. The General Counsel and Audit group provides legal assistance to the Site and interfaces with Federal and State agencies.

The EES&QP is responsible for the safety policy and program infrastructure at the Site. For example, this group contains departments for Occupational Safety and Industrial Hygiene (OS&IH), Nuclear Safety, Criticality Safety, Engineering, Fire Protection, Radiation Protection, and Quality Assurance (QA). As discussed throughout this chapter these various departments are responsible for administration of the SMPs.

The SP&I organization facilitates internal and external integration to develop overall Site cleanup goals, performance measures, and work plans. Through Site level resource allocation, acquisition strategies, systems integration, scheduling, cost estimating, and project controls, SP&I maximizes the achievement of performance measures and cost efficiencies. The SP&I organization also aligns the planning regulatory imperatives with the approved cleanup goals.

Commitment to Safety Management Programs

The SMPs establish the foundation of safe operations at the Site. The SMPs provide formal and disciplined methods of conducting business and operations while minimizing the potential for harm to the workers, public, and environment. The K-H is committed to implementing the SMPs throughout the Site and recognizes their contribution to safe operations at the Site. Monitoring program performance is imperative for (a) self-identifying deficiencies, (b) prompt and complete reporting, (c) performing root cause analyses that address deficiencies in programs and processes, and (d) developing comprehensive corrective actions to prevent recurrence. All Program Owners will use PRO-1331-SMP, *Management and Assessment of the Safety Management Programs,* to identify the performance criteria used to evaluate their program. The performance criteria appears in a site-level procedure, rather than in the Site SAR, to enable the Program Owners the flexibility to modify their monitoring criteria as data are collected. This procedure also establishes a mechanism for routinely reporting the information derived from performance monitoring.

In addition, individual nuclear Hazard Category 2 and 3 facility AB documents make a commitment to SMPs through an Administrative Control (AC). Authorization bases for all other Site facilities are within the jurisdiction of the Site SAR, which also commits to the SMPs through an AC (see Chapter 7). Routine tracking and trending of performance metrics and reported events identify potential programmatic non-compliance. However, individual non-compliances in a program do not necessarily constitute a program deficiency that renders (a) the program ineffective or (b) the premise of the inherent reliance on the SMP invalid. The AC bases describe a programmatic deficiency as multiple, serious deficiencies within the program observed over time. Once a programmatic breakdown is identified, its affect on the Site and/or specific facilities will be evaluated and could result in a PAAA reportable non-compliance or a facility TSR violation.

Safety Analysis Control Hierarchy

Some hazards at the Site present such potentially severe consequences that controls are formally analyzed, developed, and implemented. These controls are documented as Limiting Conditions for Operation (LCOs) and ACs and found in the TSRs within AB documents (e.g., Safety Analysis Reports (SARs) or Bases for Interim Operations (BIOs)). These LCOs and ACs are the most formal controls in use at the Site.

As a general rule of thumb, safety-significant SSC designations based on worker safety are limited to those systems, structures, or components whose failure is estimated to result in an acute worker fatality or serious injuries to workers. Serious injuries, as used in this definition, refers to medical treatment for immediately life-threatening or permanently disabling injuries (e.g., loss of eye, loss of limb) form other than standard industrial hazards. It specifically excludes potential latent effects (e.g., potential carcinogenic effects of radiological exposure or uptake).

The general rule of thumb cited above is not an Evaluation Guideline. It is a lower threshold of concern for which safety-significant SSC designation may be warranted, not a quantitative criteria. Estimates of worker consequences for the purpose of safety-significant SSC designation are not intended to require detailed analytical modeling. Considerations should be based on engineering judgement of possible effects and the potential added value of safety-significant SSC designation.

It is not the intent of safety analysis development to expend extensive resources on those hazards for which national consensus (i.e., Occupational Safety and Health Administration (OSHA), National Fire Protection Association (NFPA), and Radiological Protection) already defines and regulates appropriate practices without the need for special analysis. The SMPs address standard industrial hazards and are applicable to all Site facilities. For example, specific guidelines outlined in the OS&IH Program are followed whenever ladders are used regardless of the facility in which the activity is performed. The OSHA compliance is demonstrated through the SMPs, which addresses the vast number of worker safety issues typically found in all industrial settings, as well as Site facilities.

As the hazard severity increases (i.e., becomes more likely to cause death or serious injury or approach evaluation guidelines), the disciplines imposed by the SMPs go beyond merely supporting the assumptions in the safety analyses and becomes an integral part of defense in depth. In facilities where the radiological and hazardous materials are present, specific attributes of the SMPs may be elevated to discrete ACs in the facility-specific TSRs. For example, all Site facilities implement combustible material control as part of the Fire Protection Program because the occurrence of a fire is undesirable anywhere on Site from the loss of property and worker safety perspective. However, a fire involving radiological and/or hazardous materials has an added element in that workers and possibly the public may be exposed to airborne radioactive particulates. Therefore, combustible material controls are specifically itemized in facility-specific TSRs for Site facilities containing large amounts of radiological

materials. The implementation of combustible material controls in these facilities must comply with the specified TSRs.

Furthermore, engineered features that are relied upon to prevent death or serious injury to the worker, and those that are credited in the accident analyses to reduce frequency or consequences, may be elevated to a TSR control. These may vary in accordance with the hazard and facility and are identified in facility-specific AB documents. However, by virtue of applying the DOE-STD-3009-94 selection criteria, not all of the SSCs in a facility will be identified as safety-class or safety-significant SSCs even though they perform some safety function. These SSCs and other equipment important to safety are governed by specific SMPs and will be maintained throughout the life of the project. For example, fire detection and suppression systems not credited in a particular accident analysis are governed by the Fire Protection Program. The SSCs and other equipment important to safety that warrant specific consideration should be included in facility-specific AB documents in conjunction with the unique hazard or activity of concern.

Safety Management Program Monitoring

Each SMP Owner is responsible to establish program requirements, evaluation criteria and frequency, and track and trend performance data provided by the Site Projects to the Program Owners for roll up and consideration from the Site perspective. The SMPs routinely share their evaluation data with other related programs, senior management, and the Site Projects. The Site Projects and/or facilities are required to act responsively when an unfavorable trend is observed.

Most of the SMPs use data gathered by the Site Occurrence Reporting Program, which requires timely reporting of occurrences that could potentially impact safety. The report documentation requirements are satisfied through the utilization of the Occurrence Reporting and Processing System (ORPS), which is an operational database maintained by DOE, HQ. The Occurrence Reporting Program specifies the processes for occurrence categorization, notification, investigation, root cause analysis, developing corrective actions, and tracking corrective actions to completion. Occurrence reporting entails a scope of activities ranging from discovery of adverse incidents and development of actions taken to avoid recurrence of confirmed problems to DOE's concurrence with the actions taken and final closure activities. The Site Occurrence Reporting Program implements DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information* and the associated DOE Manual 232.1-1A, *Occurrence Reporting and Processing of Operations Information* and the notification requirements of DOE Order 151.1, *Comprehensive Emergency Management System.*

All SMPs will be evaluated at least annually using the Site Independent Safety Review (ISR) process governed by PRO-569-ADM-02.01, *Independent Safety Review Requirements.* Meetings will be established based upon program performance for the Program Owners to report on the health of their programs. The reports include performance monitoring data and interpretation of the data, as well as corrective actions and improvement opportunities.

Chapter Overview

The purpose of this chapter is to provide a description of the SMPs that can be referenced by facility-specific AB documents. As discussed above, the Site consists of six major closure projects (Site Projects) and four supporting organizations. The SMP Owners are organizationally in the support organizations. For ease of understanding the following terms are used in each SMP Section.

- **Attribute**: This term is defined as a specific aspect, principle, or concept that has particular nuclear and/or industrial safety significance.
- **D&D Projects**: This term is used to collectively refer to the facilities with a D&D mission.
- **Key Elements**: This term is defined as a limited number of broad categories representing the significant principles advocated by the SMP.
- **Points of Contact**:. This term is used for the person a Site Project relies on to coordinate with the SMP Owner.
- **Program Owner**: The term Program Owner refers to the Site-level Program Owner. In the text this may be indicated as either Program Owner or SMP Owner. The Program Owner is responsible for establishing program requirements, communicating requirements to the Projects, and tracking and trending performance monitoring data provided by the projects and assessments completed by others.
- **Site Projects**: Site Projects collectively refers the six major closure projects.
- **Topic**: This term is defined as specific programmatic details of the SMP that highlight AB considerations.

General Program Description

Each SMP includes a subsection that provide a very brief description of the overall SMP. It is intended to capture the general purpose and scope of the SMP and identify the regulatory drivers. Complete details of the SMP are found in the program manuals.

Authorization Bases Importance

This subsection summarizes the attributes that are based upon the identified key elements. These attributes address the wide range of hazards existing at the Site ranging from standard industrial hazards to unique hazards associated with storage of nuclear waste and decommissioning of nuclear weapon production facilities. It is not the intention of the Site SAR to identify all attributes. However, attributes that are common to all or most facilities are included.

These subsections also present any exemptions currently applicable to the SMP at the Site level. Exemptions that are limited in application are addressed in facility-specific AB documents. These are included to ensure the exemptions are factored into the safety analysis as appropriate.

Programmatic Key Elements

This subsection presents summaries of key elements of the SMPs used to conduct business, operations, and activities in a responsible manner with regard to human health, safety, and environmental protection. Individual SMP topics that are relied upon in AB accident analysis fit into one of the broad categories. For example, one of the key elements under the Nuclear Safety Program is entitled "Authorization Basis" and the topics related to this key element are (a) safety analysis documents, which include SARs, BIOs, and Facility Safety Analyses, (b) Unreviewed Safety Questions (USQs), (c) discovery issues, and (d) Justifications for Continued Operations (JCOs). The relationship of these topics is that any particular AB may consist of one or more of these types of documents.

Three key elements were required to be discussed for each SMP: (1) Organization and Administration, (2) Training and Qualifications, and (3) Configuration Management. The Organization and Administration key element addresses the organizational hierarchy of the programs from the K-H President to the Site Projects and/or facilities management. This key element collectively addresses the Site organization and management to maintain an appropriate safety culture. The SMP and Site Project responsibilities are included.

The Training and Qualification key element addresses the unique or specific training and/or qualification required for program personnel. This key element collectively ensures that the SMP is administered and executed by experienced personnel with appropriate qualifications and/or training.

The Configuration Management Program relies on the effective implementation and integration of many aspects of Site infrastructure programs to ensure that configuration control is maintained. The Configuration Management key element highlights the individual SMP's responsibility to Sitewide configuration issues. The integration of these individual SMP's components is discussed in Section 6.3, *Configuration Management.*

References

This subsection contains the documents referenced in the SMP section. References were limited to (a) Code of Federal Regulations (CFR), (b) Federal and State compliance agreements, (c) DOE policies, orders, manuals, standards, and DOE, RFFO correspondence, (d) Site plans, manuals, standards, and correspondence, and (e) Nuclear Safety Calculations that are cited in the SMP text. Implementing procedures and external drivers (e.g., national codes and regulations such as American National Standards Institute (ANSI), American Nuclear Society (ANS), and American Society of Mechanical

Engineers standards) are not specifically itemized because these references should be referenced within the program manuals, as applicable to the SMP.

Integration with Facility-specific Authorization Basis Documents

The SMPs are implemented on a Sitewide basis to assure the protection of workers, public, and environment. Facility-specific AB documents address the attributes uniquely applied or credited in the accident analyses, or provide defense in depth in the facility, as appropriate. Individual AB documents supplement the descriptions contained in this chapter to discuss items that are unique to the facility or deviations from the Site programs. Similarly, each facility-specific AB document will discuss exceptions or differences from the key elements presented here, as appropriate. If the facility implements only through the Site programs then reference can be made directly to the Site SAR and no further discussion is necessary. The Transportation SMP is not required to be included in facility-specific AB documents since transportation activities occur outside the facility.

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6.2 CONDUCT OF OPERATIONS

The Conduct of Operations Program (COOP) provides a disciplined and formal method for safely performing work and operating Site facilities. The COOP establishes the Site's core culture of formality and discipline wherein individuals seek and accept responsibility in conducting operations and work. The COOP is also (a) knowledge of requirements and discipline in observing requirements, (b) formal, disciplined, and effective control and execution of work, and (c) founded upon training, qualification, and use of procedures.

6.2.1 General Program Description

The COOP implements DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities* [DOE, 1992], through the *Site Conduct of Operations Manual* [RFETS, 2000a]. The manual applies to operations and work conducted at the Site, in both operational and support organizations. The COOP has been implemented using the graded approach in the various Site operations and support organizations. Facilities and applicable organizations use a Rocky Flats Graded Approach Matrix of Applicability to indicate the applicability to the organization of each guideline of DOE Order 5480.19, and to list those directives that implement the guidelines.

The principles contained in the COOP form the foundation of the Site's safety culture. The COOP establishes a methodology for conducting operations and work involving risk to personnel and/or the environment. This methodology depends on following established requirements, and conducting operations and work in an orderly, controlled, and prescribed manner in accordance with applicable procedures. Applying the formality and discipline required by the COOP enables Site employees to achieve enhanced safety, consistency, and excellence in operations and work. Maintaining adequate COOP performance in facilities and organizations at the Site is not a static achievement. Continuing training and positive reinforcement by management are required to reap the benefits in safety and efficiency that are derived from the principles required by COOP, as well as promoting continuing improvement.

6.2.2 Authorization Bases Importance

An underlining assumption of AB accident analyses is that effective management of facility-specific and Site ABs is an important ongoing requirement. The COOP provides tools to ensure continuous vigilance by management and personnel conducting work with the potential to impact AB requirements, such as maintenance, equipment operations, and surveillances. Thus, the COOP is essential to ensuring that AB requirements are continually met.

The COOP addresses important AB elements including (a) operability determinations for safety SSCs, (b) management of discovery issues, (c) administration

of AB violations, and (d) AB surveillance and compensatory measures tracking. These elements are discussed in Section 6.2.3, *Programmatic Key Elements*, Authorization Basis Operational Management.

The COOP also addresses other important principles that AB accident analyses rely on, including (a) proper planning, scheduling, authorization, and control of work (e.g., the use of Plans of the Day (PODs), Pre-Evolution Briefings (PEBs), and Job Task Briefings (JTBs)); (b) implementation of operating practices that set standards for the required professional conduct and level of performance to ensure facilities are operated, and work is conducted safely and efficiently (including shift relief and turnover, procedural compliance, and the use of logs and round sheets); (c) maintenance of minimum staffing requirements for operations and support personnel as required by applicable facility-specific ABs and Site Project plans; and (d) ensuring that facility configuration is maintained in accordance with design requirements and that operators know the status of equipment and systems (including controlling the removal of SSCs from service, controlling temporary modifications to SSCs, and labeling components of AB important systems and equipment).

6.2.3 Programmatic Key Elements

The following key elements categorize the major topics of COOP that are relied upon to establish the Site core culture of formality and discipline in performing operations and conducting work. The programmatic topics within these key elements are summarized in the following subsections. Additional details for each of these topics are provided in the *Site Conduct of Operations Manual* [RFETS, 2000a]. Accordingly, the *Site Conduct of Operations Manual* should be consulted for additional information on each topic.

- Program Organization and Administration
- Operations Organization, Administration, and Staffing
- Authorization Basis Operational Management
- Work Control
- Operating Practices
- Status and Operability
- Training and Qualifications
- Configuration Management

Program Organization and Administration

The K-H President approves the Sitewide Conduct of Operations policy and delegates its implementation and administration through the K-H Vice Presidents and Site Project Managers. The Vice President and Director of EES&QP sponsors the Site COOP through the Site COOP Manager. The Site COOP Manager (a) establishes and maintains COOP requirements through the *Site Conduct of Operations Manual,* (b) oversees COOP implementation at the Site and keeps DOE, Rocky Flats Field Office (RFFO) informed of major changes, (c) serves as the Subject Matter Expert (SME) for COOP issues at the Site, and (d) maintains documents required to manage the COOP.

At the Site Project or facility level, management ensures a high level of performance is achieved through effective implementation of COOP principles. This is accomplished by (a) establishing high standards and expectations, (b) communicating the standards and expectations to the working level, (c) providing sufficient resources to operations and support organizations, (d) ensuring personnel are trained, (e) closely monitoring performance in operations and providing feedback for improvement, and (f) holding workers and their supervisors accountable for their performance.

Operations Organization, Administration, and Staffing

The organization and administration of operations ensures that a high level of performance is achieved through effective implementation and control of activities. The following programmatic topics are related to Operations Organization, Administration and Staffing.

Management, Operations, and Support Personnel Responsibilities

Responsibilities of managers, operations, and support personnel are provided in the *Site Conduct of Operations Manual* [RFETS, 2000a]. Management establishes operating objectives and safety goals, expected performance levels, and required resources. Standards and expectations are integrated into policies and procedures, and are communicated to the working level through training and by supervisory monitoring and guidance of operations and work. Continuing operational improvement is facilitated through feedback of lessons learned from operations assessments and Site and DOE Complex events. Personnel are held accountable for their performance through supervisory counseling and, when necessary, disciplinary measures.

Staff Requirements

Minimum staffing requirements for operations and support personnel are determined by the Site Project Managers as required by applicable facility-specific ABs and Site Project plans. The establishment and maintenance of a minimum staff provides assurance that facilities are capable of operating within the controls defined in their TSRs at all times. Minimum staff defines, by position and number, those management and operating personnel that are necessary for facility safety. Minimum staffing assures that qualified personnel are available to provide the expertise and decision making capability required to operate the facility within the analyzed safety envelope.

Standing, Operations, Shift, and Night Orders

Standing Orders are documents that provide guidance or direction applicable Sitewide when rapid dissemination is considered necessary by senior management. Shift Orders, Night Orders, and Operations Orders are established to satisfy the DOE Order 5480.19 requirement to provide timely information and instructions to operators.

Operations Orders are either administrative or technical. Administrative Operations Orders contain information about operations, administrative matters, work priorities, and matters of a similar nature. Administrative Operations Orders that contain information intended to be permanent should be incorporated into procedures. Technical Operations Orders may direct manipulation of systems or prescribe requirements that affect technical matters. They receive the same reviews as procedures and are developed meeting *Integrated Work Control Program Manual* [RFETS, 2000b] requirements. Technical Operations Orders are not considered appropriate for conducting operational activities of a sustained nature; procedures and IWCP work packages, as applicable, are to be used instead.

Shift Orders are similar to Administrative Operations Orders in that they address the same kinds of topics, but they serve as a means for management to quickly communicate short-term information and administrative instructions to assigned personnel. Night Orders may be used by managers to communicate short-term information and administrative instructions to facility personnel.

Overtime Limitations

Overtime and total hours worked limitations apply to all personnel, hourly and salaried, working overtime at the Site, including those employed by more than one employer at the Site. The purpose of having constraints on overtime and total hours worked by an individual is to enhance safety and to promote effective manpower utilization. Lack of sleep and excessive work without adequate rest can lead to inefficiency and accidents caused by fatigue. Management's intention is to preclude individuals from working excessive overtime, working excessive hours for multiple employers, and to preclude continuous work for a prolonged period without time off.

Operations Assessments and Lessons Learned

The COOP assessments are a part of the assessment program at the Site. They contribute to effective ISM in which safety is enhanced through feedback and improvement. Improvements identified and taken as a result of objective assessment shape the scope of future work, can result in improved productivity, and can help shape controls for that work. The COOP assessments are conducted by supervisors and staff personnel in order to directly observe operations activities. They provide management with objective evaluation of operations practices; they identify deficiencies and areas needing improvement, as well as noteworthy practices.

Similarly, feeding back lessons learned from Site and DOE Complex incidents is important to continuing improvement. Lessons Learned should be distributed widely and used in training so that applicable employees obtain the benefit of Lessons Learned.

Required Reading

A required reading file is established to ensure operations personnel are made aware of information that is (a) important to safe and efficient operation of their work station, (b) important to facility safety, (c) applicable based on occurrences or lessons learned, and (d) a significant change to procedures or other documents affecting the facility, or to systems or equipment operated by facility operations personnel. The *Site Conduct of Operations Manual* [RFETS, 2000c] specifies personnel for whom the Required Reading Program is required. A required reading typically contains information such as (a) significant procedure and other relevant document changes, (b) equipment design changes, (c) applicable DOE, industry, and Site occurrences and lessons learned, (d) information necessary to keep operations personnel aware of current facility activities, and (e) other information determined by facility management. Periodic review of the required reading file is performed by individuals designated by management to verify assigned reading is being completed, and to remove material that has been read by designated personnel from the required reading file. Such material is placed in a reference file for a period determined by management.

Abnormal Events Reporting and Investigation

Circumstances, such as occurrences, conditions, or events that could have a negative impact on safety receive appropriate response including identification, notification, categorization, investigation, evaluation, tracking, trending, and corrective action. Occurrences are categorized, and fact finding promptly conducted in accordance with the Occurrence Reporting Program

Access Control

Access controls exist in many facilities to ensure safety of visitors and workers, and compliance with security and training requirements. Facility management determine and post access training requirements for their facilities. All Site managers ensure that employees for whom they are responsible meet facility entry requirements or have escorts if they are assigned work in facilities that have access requirements.

Authorization Basis Operational Management

A nuclear facility AB is the set of facility safety analyses and operational requirements relied on by DOE to authorize operations. Effective management of the AB in a nuclear facility is an important ongoing requirement. Continuous vigilance by facility management and personnel conducting work impacting AB requirements, such as maintenance, equipment operations, and surveillances, is needed to ensure that AB requirements are continually met. If compliance cannot be maintained, appropriate required actions are initiated as specified in the AB for the facility and/or in the *Site*

Conduct of Operations Manual [RFETS, 2000a]. The following programmatic topics are related to Authorization Basis Operational Management.

Operability Determination

When conditions, deficiencies, problems, or concerns are identified that call into question the operability of a safety SSC and other equipment important to safety, determination of operability is accomplished using the process provided in the *Site Conduct of Operations Manual.* Facility management (as specified in the *Site Conduct of Operations Manual)* uses the Technical Concern Assessment Checklist provided in the manual to document the determination.

Management of Discovery Issues

When information is identified which indicates that a discovery issue exists, facility management (as specified in the *Site Conduct of Operations Manual)* takes action to place the facility in a safe condition as required by the AB. Facility management initiates actions in accordance with the discovery issue process (see Section 6.11, *Nuclear Safety*), if applicable, files the occurrence report and makes required notifications.

Administration of AB Violations

The actions required in response to AB violations are specified in AB documents. If a violation occurs, facility management (as specified in the *Site Conduct of Operations Manual)* takes the required actions specified in the AB and documents the violation and suspension, if applicable, files the occurrence report, and makes required notifications. The *Site Conduct of Operations Manual* provides requirements that must be completed in order for the Site Project Manager to clear the AB violation, and to approve resumption of operations.

AB Surveillance and Compensatory Measures Tracking

A system is required for tracking and documenting AB surveillances and AB compliance-related compensatory measures or other actions. The system may be used to track other items as desired by facility management. The *Site Conduct of Operations Manual* provides requirements for implementing and administering a compliance tracking system, and for scheduling, performing, and documenting surveillances or compensatory measures.

Work Control

The safe performance of activities at the Site depends on proper planning, scheduling, authorization, and control of work, process and utility system changes, and non-routine activities. The following programmatic topics are related to Work Control.

General Work Controls

Facility management (as specified in the *Site Conduct of Operations Manual)* authorizes commencement of (a) maintenance and other work, (b) major process and utility system changes, and (c) non-routine operations, evolutions, tests and experiments. Facility management specifies in an Operations Order or procedure those routine activities and minor process and utility system changes that can be performed without first informing facility management (as specified in the *Site Conduct of Operations Manual).* All personnel are required to notify facility management (as specified in the *Site Conduct of Operations Manual)* of changes in status of equipment and systems.

Plan of the Day

The PODs are used to schedule and authorize activities in the facilities. The PODs list operations, maintenance, tests, surveillances, inspections, D&D, and other activities authorized by the facility management. The POD meeting is an important forum for resolving conflicts in scheduling work and facilitating discussions about planned activities. Facility management approval provides coordination of activities in an effort to avoid undesirable interactions between activities. Each facility should plan and schedule work activities with about a three month horizon, refine the planning about a week in advance, and translate detail into the POD. The content of a typical POD and POD specific requirements are provided in the *Site Conduct of Operations Manual* [RFETS, 2000a].

Pre-Evolution Briefings and Job Task Briefings

Briefings (PEBs and JTBs) are performed Sitewide to ensure that personnel preparing to conduct operations and other work understand what is to be performed, understand the hazards and controls, and have an opportunity to ask questions or raise concerns. The PEB is the more formal of the two, is documented, and is conducted by an Evolution Supervisor for (a) tests and experiments, (b) new startups, (c) operations and work activities that are complex, non-routine or hazardous, and (d) D&D work. It is conducted for all energized electrical work as defined in the *Occupational Safety and Industrial Hygiene Program Manual* [RFETS, 2000c].

A JTB is less formal than a PEB, is conducted by the foreman with the workers involved, and serves as one method by which ISM is implemented on-the-floor for noncomplex, routine, and low hazard work activities. A JTB does not have to be documented. All PEBs and JTBs emphasize safety, procedural compliance, stop work authority, hazards, and controls. Information concerning evolutions requiring PEBs and JTBs, and preparing for and conducting them, is included in the *Site Conduct of Operations Manual.*

Operating Practices

Operating Practices set the standards for the required professional conduct and level of performance to ensure facilities are operated, and work is conducted, safely and efficiently. The following programmatic topics are related to Operating Practices.

General Work Controls

Standards for the professional conduct of operations and work are established and followed so that worker performance meets the expectations of management. Appropriate attention to facility conditions is required. A professional atmosphere conducive to safe and efficient operation must be maintained in control rooms. Shift turnovers are conducted to provide operators and workers an accurate picture of the status of equipment, systems, and work in progress. Operators and workers are provided guidance in proper communications, which are essential to the safe and efficient conduct of activities. Employees are required to use and comply with applicable procedures in order to perform operations and work in a safe and disciplined manner.

Shift Relief and Turnover

Shift relief and turnover is conducted to provide operators and workers an accurate picture of the status of equipment, systems, and work in progress. Formal shift relief and turnover is required to be conducted for activities being performed by multiple shifts (shift work). Shift personnel retain full responsibility for their position until properly relieved. Shift relief and turnover is conducted by supervisors and individual operators, as appropriate to the activity/operation. For work crews conducting work on multiple shifts, a briefing for the oncoming crew by the supervisor may suffice if turnover between individuals is not considered necessary by facility management. Facility management identifies positions requiring shift relief and turnover, the content of shift relief and turnover checklists, and filing and review requirements.

Work Stations and Control Rooms

Work stations are established as necessary for operations and support personnel having on-shift responsibilities, and are equipped with, or have access to, necessary reference material including manuals, procedures, drawings, communication equipment, and office equipment. Access to control rooms that monitor equipment or systems is limited to persons with a need to be in the area. Control room boundaries are clearly marked, and permission to enter should be granted by the responsible control room individual or the supervisor. A professional and businesslike atmosphere conducive to safe and efficient operation is to be maintained in all control rooms.

Procedural Compliance and Procedure Use Requirements

Adherence to the requirements of procedural compliance represents a firm commitment to disciplined and safe operations at the Site. Procedures contain written instructions to conduct operations, surveillances and tests, and to respond to abnormal or emergency situations or alarm conditions. Technical procedures prescribe precisely how to accomplish the various technical tasks associated with (a) starting up, (b) performing surveillances, (c) testing, operating, and maintaining equipment and systems, (d) generating or physically moving waste, or (e) activities that may negatively impact safety, health, or the environment. Technical procedures specify fixed tasks and define activities in a way that ensures such operations are safe, efficient, and practiced within

appropriate margins of safety. Procedures are developed with sufficient detail to enable performance of the required tasks without direct supervision. They are written with sufficient detail depending on the complexity of the task, experience and training of the operators, frequency of performance, and consequences of error. Employees are required to use and comply with applicable procedures. All procedures are to be performed as written.

Operator Aids

Operator Aids are postings that contain information to assist personnel in performing their duties. Operator Aids may be pages or sections excerpted from procedures, system drawings, data tables, graphs, or other information. Where standard signs are provided by other Site program requirements, they are not included in the Operator Aid controls described in the *Site Conduct of Operations Manual.* Operator Aids are authorized by facility management (as specified in the *Site Conduct of Operations Manual),* and are maintained current. They shall not alter or conflict with approved procedures, and are not to be used in lieu of procedures.

Communications

Communications need to be reliable to provide accurate transmission of information for conducting operations activities. All personnel conducting operations activities are required to communicate formally and use standardized terminology. Communications need to be distinct, deliberate, clear, and concise. When communicating verbally in an operational setting, the Phonetic Alphabet is used except when referencing a common acronym such as TSR and LCO.

Facility management should minimize use of the Life Safety/Disaster Warning (LS/DW) System; use is by authorized personnel for emergency and other essential communications. When necessary to work in areas where the LS/DW System or emergency alarms cannot be heard, alternate methods of communications are used such as beacons, strobes, vibrating pagers, radio headsets, or positioning persons where alarms are audible to communicate with those in the area without adequate coverage. In nuclear facilities, use of alternate methods must meet AB requirements.

Logs and Round Sheets

Narrative Logs are formal records of day-to-day operations, emergencies, and abnormal or unexpected events. Sufficient information should be recorded to aid in event reconstruction and cause determination. In order to promote completeness and accuracy, information should be promptly and legibly recorded in logs. Logs are titled on the outside and have sequentially numbered pages. If computerized narrative logs are used they are printed at the end of each shift and maintained in a binder that identifies the log title. The log printout is signed and dated at shift relief and turnover.

Round sheets are used to collect data, record equipment status, and note unusual conditions. Facility management of the organization responsible for the performance of the rounds approves the information to be included on the round sheet. Logs and round

sheet reviews are conducted by managers in accordance with the *Site Conduct of Operations Manual.*

Response to Indications

Personnel must respond correctly to indications displayed by instruments, charts, printouts, valve position indicators, and alarms until the indications are proven to be inaccurate. In other words, operators should "believe their indications." Actions to be taken when there is doubt concerning the accuracy of an indication, and when an indication is proven to be inaccurate, are provided in the *Site Conduct of Operations Manual.*

Response to Alarms

Alarms are warning features to inform operations personnel of conditions not within normal parameters. Alarm actuation normally requires prompt response from operations or support personnel to maintain or restore safe operating conditions. Operators treat all alarms as accurate and respond accordingly.

Resetting Protective Devices

When a protective device such as a circuit breaker or fuse trips or fails, operations and support personnel responsibilities are to inform facility management (as specified in the *Site Conduct of Operations Manual)* and attempt to determine the cause of the trip or failure. If directed by facility management, the device may be reset one time. A protective device is not reset a second time unless the cause of the trip is understood and corrected, and has been authorized by facility management.

Status and Operability

Good operating discipline ensures that operators know the status of equipment and systems. The following programmatic topics are related to Status and Operability.

Status Control

Good operating practices include operations personnel knowing and controlling the status of equipment and systems. Maintaining accurate status is an important aspect of operations formality. Changes in equipment and component status will occur regularly in facilities and the status must be maintained up-to-date, on status boards or computer displays. Status displays are used as an accurate portrayal of major equipment and system status and as an aid in making operational decisions based on understanding current status.

Component Labeling

Clear labeling improves the ability of operations and support personnel to identify system components positively and quickly. Since the Site is in the process of closing, all systems and equipment are not labeled. Labeling is necessary for (a) startup of new

systems or processes; (b) equipment or systems that are operated in order to conduct AB surveillances; (c) other systems and equipment if specified in the applicable AB; and (d) other items as determined by the facility management to enhance operations. Specification, design, and installation requirements for labels are contained in Site standards.

Removing Systems and Equipment from Service

Removal of systems and equipment from service is controlled in order to meet AB requirements, avoid unauthorized operation, and avoid damage to systems and equipment, and for personnel safety. Facility management (as specified in the *Site Conduct of Operations Manual)* is responsible for authorizing the placement of items in out-of-service or out-of-commission status and for physical removal of equipment. The status of out-of-service and out-of-commission items is maintained as determined by facility management.

Component Lineups and Independent Verification

The performance of component lineups is fundamental for establishing system status. The initial startup of systems and equipment is conducted after lineup has been performed to ensure the required positions of valves, switches, components, circuit breakers, and equipment have been established. For many systems, performance of a lineup by a single individual is sufficient, but for those components where mispositioning could result in an unsafe condition, or result in release of radioactive or hazardous material to the environment, a second individual verifies positions are correct. The second individual is accomplishing independent verification in this case. The independent verification can also be performed as a stand-alone activity when desired.

Return to Service and Operability

Return to Service and Operability Declaration is required for safety SSCs and may be used for returning all SSCs to service. It is used to return SSCs to operable status or to achieve operability after modification or construction. Facility management (as specified in the *Site Conduct of Operations Manual)* verifies satisfactory completion of the necessary work to regain operability, such as testing in accordance with the *Integrated Work Control Program Manual* [RFETS, 2000b] and/or completion of applicable AB surveillances. Facility management completes the applicable sections of the Return to Service and Operability Checklist provided in the *Site Conduct of Operations Manual.*

Planned Out of Tolerance

Unless otherwise specified in a facility's AB, when performance of a planned activity such as maintenance or testing (except for AB surveillances) will result in not complying with AB requirements, facility management (as specified in the *Site Conduct of Operations Manual)* implements applicable actions prior to initiating the activity and makes required notifications. Facility management also makes required notifications when the out-of-tolerance condition is cleared.

Training and Qualification

Trained and qualified personnel operate facility equipment or systems, except where directly supervised trainees operate equipment as part of on-shift training. Training programs include initial and continuing components and are established to develop, enhance, and verify the knowledge and skills of individuals. The Site Training Program is described in Section 6.16.

Configuration Management

As discussed under the Configuration Management Program (see Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. The Conduct of Operations Program contributes to the sitewide configuration management by implementing use of temporary modifications and controlled deactivation of alarms. Temporary modifications and controlled deactivation of alarms are discussed below.

Temporary Modifications

Temporary modifications are physical changes to SSCs, thought to be of a temporary nature, which are minor in scope and planned to be in place for a short period. Temporary modifications may, however, stay in place indefinitely if considered appropriate by management based on such considerations as facility life, cost, or need. The process for administering temporary modifications is discussed in the *Site Conduct of Operations Manual.* Temporary modifications are initiated by filling out an IWCP Work Process Form for work package development. The administrative process includes (a) evaluation in accordance with the Nuclear Safety Program's USQ process for nuclear facilities and activities and (b) determination if training or procedure changes are necessary based on the type of temporary modification.

Controlled Deactivation of Alarms

Alarms provide an important function to warn operators of conditions that are outside of normal limits. Deactivation of alarms may be required for a variety of reasons, including equipment failure, damage, or extended maintenance, or to silence nuisance alarms or alarms which may be locked in for extended periods of time. Due to the importance of alarms, their deactivation is conducted in a controlled and formal manner based on configuration management principles. The *Site Conduct of Operations Manual* provides requirements for deactivating alarms, including facility management approval and performance of an evaluation in accordance with the Nuclear Safety Program's USQ process for safety SSCs in nuclear facilities.

6.2.4 References

DOE, 1992 — *Conduct of Operations Requirements for DOE Facilities,* DOE Order 5480.19, U.S. Department of Energy, Washington, D.C., May 18, 1992.

RFETS, 2000a *Site Conduct of Operations Manual,* MAN-066-COOP, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, October 30, 2000.

RFETS, 2000b *Integrated Work Control Program Manual,* MAN-071-IWCP, Revision 3, Rocky Flats Environmental Technology Site, Golden, CO, October 30, 2000.

RFETS, 2000c *Occupational Safety and Industrial Hygiene Program Manual,* MAN-072-OS&IH PM, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, November 30, 2000.

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6.3 CONFIGURATION MANAGEMENT

Configuration management at the Site is an integration of various functions within specific SMPs that ensure (a) operational status is documented and evaluated against the analyzed safety basis, (b) physical modifications are properly planned, designed, approved, and implemented, and (c) administrative components of configuration such as AB documents, procedures, and training materials remain consistent as physical changes are made to SSCs. The Configuration Management Program effectively integrates each of the contributing functions. Although each SMP uses different mechanisms to initiate and evaluate proposed changes, the basic elements of configuration management can be identified in each. When a need for a modification is identified, the change process is initiated. The proposal for the change is evaluated and authorized, design is completed and thoroughly analyzed, work is planned and completed. Documentation supports all phases of the change process, commensurate with the significance of the system being modified or the complexity of the change.

6.3.1 General Program Description

The Site Configuration Management Program recommends the necessary interfaces that the Site infrastructure programs need to consider for effective change control processes (RFETS, 2000c). These programs identify, implement, and monitor the mechanisms to be used for configuration management within the program (e.g., nuclear safety uses the USQ and ISR processes). In general, these mechanisms are driven by requirements stated in DOE orders for the specific program (i.e., not from a single DOE order addressing configuration management principles). The Site relies on individual SMPs to effectively integrate the configuration management roles of their programs.

In this respect, the Site Configuration Management Program departs from the traditional concept of a centralized program. Also, the Site Configuration Management Program departs somewhat from a classic design configuration management program because it was instated after construction of the Site. Accurate design drawings and specifications are not always available, and as a closure site, it is not cost effective to produce them. The Site Configuration Management Program also differs from the classic configuration management model in that expands its responsibilities to ensure all the administrative aspects of the process are involved as changes are needed; for example, (a) procedures (both technical and administrative), which include information affected by the proposed change, are revised, (b) personnel, who perform activities impacted by the proposed change, are trained, and (c) operator aids, such as detector coverage matrices, are updated.

In general, the Configuration Management process works as follows: (1) a change is requested for equipment important to safety, (2) the change is reviewed and, if determined to be necessary and appropriate, the responsible manager authorizes preparation of required documents, (3) the change is prepared (i.e., an engineering design

package is developed, calculations completed, and/or drawings or sketches prepared, and an IWCP package developed), (4) the product is reviewed by SMEs, Nuclear Safety, responsible manager(s), and ISRC (see ISRC discussion under Nuclear Safety Program), as necessary, and approval to implement the change is obtained, (5) changes to equipment important to safety are tracked from the baseline configuration to the new baseline using the IWCP package, (if no baseline documents exist, they are created using facility walkdowns and operational information), (6) change is implemented and verified as necessary and then becomes part of the new baseline through completion of the IWCP package. Administrative changes to procedures, specifications, or controls follow a similar flow.

The SMPs listed in this chapter contribute to the integration of configuration management. Each SMP's contribution to Configuration Management is summarized as a key element in their respective section of this chapter. Other Site programs not designated as SMPs that contribute significantly to configuration management at the Site include (a) Computer Software, (b) Material Control and Accountability (MC&A), and (c) Procurement. These programs but are summarized in the following paragraphs. Specific instruction and detail may be found in the reference material cited.

The Computer Software Program implements, via the *Computer Software Management Manual* [RFETS, 1997], the Site QA Program requirements [RFETS, 2000b] for computer software, used in connection with hazardous materials, radiological materials, or waste products at the Site or transported between the Site and waste storage facilities such as the Waste Isolation Pilot Plant (WIPP). Examples of such software include software that (a) determines Special Nuclear Material (SNM) physical storage dimensions (criticality issues), (b) used for SNM or hazardous chemical tracking/accountability, (c) define evacuation accountability or other personnel safety tracking systems, (d) determine or monitor personnel, facility, or environmental radiation exposure; release, radiation work limits, or dose rates, (e) determine hazardous chemical exposure for personnel, facility, or the environment, (f) monitor, collect, or acquire facility or equipment operational data which is used to determine operational status, limits, settings, or configurations, and (g) provide laboratory analysis of facility or environmental samples. The processes used for software verification and validation and mechanisms implemented for control of software are presented in the *Computer Software Management Manual.*

The MC&A Program is implemented through the *Nuclear Material Safeguards Manual* [RFETS, 2000a] and addresses the requirements for nuclear materials control and accountability at the Site. This program ensures nuclear materials are used, stored, and accounted for in such a way that any attempt at theft or diversion is deterred and/or detected. Material quantities are often limited by requirements imposed by MC&A providing bounding conditions for analysis.

The procurement system ensures that the correct supplies and services are procured to support the safe and efficient closure of the Site and proper approval from DOE, RFFO is obtained when required. Physical components are procured by using design or engineering documents, IWCP packages, or specifications. Use and installation

of procured materials and services are typically governed by procedures or IWCP packages as described in this chapter.

The primary requirement documents that establish the Configuration Management Program are listed below.

- DOE Order 430.1A, *Life Cycle Asset Management* [DOE, 1998]
- DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities* [DOE, 1992]
- DOE Order 5480.23, *Nuclear Safety Analysis Reports* [DOE. 1994]
- DOE-STD-1073-93, *Guide for Operational Configuration Management Program* [DOE, 1993]

6.3.2 Authorization Bases Importance

The AB importance associated with the Configuration Management Program is focused on safety and credited SSCs. The approved ABs used at the Site represent the physical and administrative controls established by DOE and K-H in order to best protect the worker, public, and environment. The AB serves as the license to operate nuclear Hazard Category 2 and 3 facilities; thus it is important to maintain the integrity of the controls and their bases. Therefore, physical changes that are made to safety and credited SSCs through the Engineering or IWCP processes, as well as AB supporting procedures and references are carefully controlled and evaluated. Changes proposed to ACs are evaluated through the USQ process by the development of a page change document. The ABs integrity depends on thorough research and review as mandated by Site procedures (e.g., Nuclear Safety, Engineering, and ISR) during design changes, modifications, maintenance, operational activities, and decommissioning.

The Site relies upon the Site ISRC to provide a site-wide process for the review of the identified items associated with configuration management. The primary purpose of the ISRC is to identify safety issues that could impact the safety envelope, safety equipment, worker safety, public safety, or the environment, to evaluate the acceptability of the safety consequences and limitations or controls posed by activities, and to advise line management accordingly. For example, as changes are made to SSCs that are important to safety or credited in ABs, the review process ensures that the supporting analyses remain intact and that procedures, drawings, and training are updated to ensure consistency, or triggers AB revisions approved through the designated authority (e. g., USQs require DOE, RFFO approval).

Physical changes to safety or credited SSCs must be evaluated against the appropriate facility-specific AB document(s), and the AB document(s) must be revised and approved by DOE, RFFO if the safety evaluation results in a USQ. Also, procedures and other documentation such as system engineering reports and operator aids, that implement the AB must be evaluated for impacts. Modifications to and removal of safety

and credited SSCs are controlled by the Site Configuration Management Program to ensure appropriate planning, design, and implementation are accomplished to maintain the approved AB.

The AB documents inherently assume that configuration management is being adhered to with respect to the documented conditions, assumptions, and controls. Adherence to configuration management principles ensures facility conditions are accurately reflected in analysis and necessary supporting documentation such as drawings, procedures, and system engineering reports. The *Nuclear Safety Manual* requires an implementation verification review (IVR) to ensure the adequacy of implementation before a facility is authorized to operated under a new configuration. The Configuration Management Program ensures that what is analyzed in the accident analyses is what exists and will not be deliberately changed without prior consideration and authorization.

6.3.3 Programmatic Key Elements

The following key elements categorize the major topics of the Configuration Management Program that are relied upon in AB accident analyses. The topics within these key elements are summarized in the following subsections.

- Organization and Administration
- Physical Configurations
- Authorization Bases
- Documentation
- Training and Qualifications

Organization and Administration

The K-H President accepts ultimate responsibility for the Site Configuration Management Program and delegates its implementation and administration through the EES&QP and Engineering Department to the Site Chief Engineer (SCE). However, as discussed in the *Configuration Change Control Manual* [RFETS, 2000c] and summarized in this section, configuration management at RFETS is the integration of principles from many programs. The Program Owners of these various programs are responsible for the implementation and administration of their specific configuration management principle(s). Refer to the other sections of this chapter for the configuration management principles within the Site SMPs.

Physical Configurations

Physical configuration includes credited SSCs and other equipment important to safety governed by the SMPs, such as fire protection equipment, inventory of hazardous materials (nuclear materials, chemicals, radiation sources, and flammable materials) as

well as physical plant configurations or facility structural components that maintain confinement or deter progression of fire. Thus, these are discussed in the following subsections. The SMPs implementing the processes controlling the configuration of these items are also listed.

Structure, System, and Component Changes

The Engineering Program controls the design process to change SSCs. The design process also requires identification of all Site documents that require revision as a result of the proposed change. Refer to the Configuration Management key element in the Engineering Program section of this chapter for more details.

Changes in equipment and component status will occur regularly in facilities. Some will be related to placing items out of service for repair or placing them OOC. Others will be due to placing items back in service, and many will be due to system startup and shutdown. System status displays are used as an accurate portrayal of major equipment and system status and as an aid for making operational decisions based on understanding current status.

Changes to established configurations are evaluated against the AB documents of a particular facility, as well as the Site SAR [RFETS, 2000d], as applicable. This is particularly important from an equipment positioning and operability standpoint. Knowing the status of credited equipment, and whether the equipment is operable, ensures that the facility remains within the safety envelope established by the AB documents. Temporary modifications and controlled deactivation of alarms are implemented through the COOP, which ensures the modifications and alarm deactivations are within the authorized safety envelope. Refer to the Configuration Management key element in the COOP section of this chapter for additional information.

Fire Protection Changes

Fire Protection Program manages the configuration of fire barriers and fire protection systems and equipment, including alarms, detectors, fire phones and pull stations, water supplies, extinguishers, and response capability. The Fire Protection Program also prepares the Fire Hazards Analyses (FHAs), which are provided as an input to nuclear safety analyses. The FHAs evaluate the facility conditions, fire protection system capability, and fire loading. The nuclear safety analyses use the FHAs to (a) confirm that the analysis conservatively bounds all probable fires and (b) identify controls to be documented in the AB that preserve the assumptions of the analysis. Changes to fire protection systems, as well as evaluation of deficiencies as they arise are managed by the Fire Protection Program and its implementing procedures. Changes to fire protection systems are accomplished through engineering and IWCP processes described above. Refer to the Configuration Management key element in the Fire Protection Program section of this chapter for additional information.

Other Engineered Safety Feature Changes

Other Engineered Safety Features include equipment managed by the Radiological Control Program, Criticality Safety Program, and the Occupational Safety and Industrial Hygiene Program. Typical equipment includes primary confinement barriers (e.g., gloveboxes, tents, and ventilation systems), CAMs, SAAMs, CAASs, beryllium monitors, egress lighting, LS/DW system, eyewash stations, flammable gas, restraints, and hoisting and rigging equipment.

Nuclear Material Changes

Facility hazard classifications are based on the quantity of hazardous material (both nuclear and chemical) present in the facility. The facility hazard classification determines the appropriate level of safety analysis and required controls. In addition to facility's hazardous material inventories, nuclear material packaging, handling, location, transferring, and transportation are also important aspects of Site operations. The SMPs that interrelate to maintain configuration of nuclear materials are predominantly Criticality Safety, Nuclear Safety, Radiological Protection, Transportation Safety, and Waste Management. Refer to the Configuration Management key element in these programs for additional information.

Chemical Inventory Changes

Changes in chemical inventories may have an impact on auditable safety analyses for facilities housing chemicals as addressed in the Site SAR [RFETS, 2000d]. The type and amount of certain chemicals is the basis for a hazard classification of non-nuclear moderate or low. The Chemical Management Program within the Environmental Management Program evaluates chemicals as they are ordered to ensure regulatory thresholds are not compromised. Refer to the *Chemical Life Cycle Management* topic under the key element entitled *Strategic Planning and Implementation* for the Environmental Management Program in this chapter.

Authorization Bases

The Nuclear Safety Program uses the USQ process to evaluate changes and identify when a change requires authorization by DOE, RFFO. Work packages, procedures, manuals, and proposed activities require review by nuclear safety, if analysis, assumptions, or controls may be challenged. The Nuclear Safety Program requires annual reviews, and revisions if necessary, of all AB documents to confirm the AB remains accurate, reflects physical changes that were completed since the last approval, and supports safety performance of Site mission-related activities. Refer to the Configuration Management key element in the Nuclear Safety Program for additional information.

Documentation

Site documentation associated with Configuration Management includes items such as drawings, specifications, procedures, Criticality Safety Evaluations (CSE),

Criticality Safety Operating Limits (CSOLs), waste packaging instructions, and calculations. Documentation is developed, revised, and otherwise controlled by the various Site infrastructure programs, many of which are described as SMPs within this chapter. Refer to Section 6.5, Document Management for additional information.

Training and Qualifications

The Configuration Management Program has no unique training and qualifications requirements. However, specific training and qualification requirements may be mandated by the other SMPs to perform their contribution to configuration management. Refer to the Training and Qualification and Configuration Management key elements within the other SMPs.

6.3.4 References

DOE, 1992 — *Conduct of Operations Requirements for DOE Facilities,* DOE Order 5480.19, U.S. Department of Energy, Washington, D.C., May 18, 1992.

DOE, 1993 — *Guide for Operational Configuration Management Program,* DOE-STD-1073-93, U.S. Department of Energy, Washington, D.C., November 1993.

DOE, 1994 — *Nuclear Safety Analysis Reports,* DOE Order 5480.23, U.S. Department of Energy, Washington, D.C., March 10, 1994.

DOE, 1998 — *Life Cycle Asset Management,* DOE Order 430.1A, U.S. Department of Energy, Washington, D.C., October 14, 1998.

RFETS, 1997 — *Computer Software Management Manual,* 1-MAN-004-CSMM, Revision 0, Rocky Flats Environmental Technology Site, Golden, CO., February 1997.

RFETS, 2000a — *Materials Control and Accountability Manual,* MAN-010-MCA, Revision 2, Rocky Flats Environmental Technology Site, Golden, CO., September 2000.

RFETS, 2000b — *Quality Assurance Program Manual,* MAN-131-QAPM, Revision 0, Rocky Flats Environmental Technology Site, Golden, CO., November 2000.

RFETS, 2000c — *Configuration Change Control Program Manual Site Configuration Control Description,* Revision 6, Rocky Flats Environmental Technology Site, Golden, CO, December 2000.

RFETS, 2000d — *Rocky Flats Environmental Technology Site Safety Analysis Report,* Revision 2, Rocky Flats Environmental Technology Site, Golden, CO, November 2000.

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6.4 CRITICALITY SAFETY

The Criticality Safety Program establishes nuclear criticality safety requirements for all personnel at the Site. The program provides general emergency response requirements for all personnel and visitors at the Site and details specific requirements for facilities that handle, process, store, stage, transfer, and/or transport a significant quantity of fissionable material.

6.4.1 General Program Description

The *Nuclear Criticality Safety Manual* [RFETS, 2000b] defines how the DOE order requirements are implemented at the Site, details organizational roles and responsibilities, and establishes the framework for implementing procedures. The Criticality Safety Program is implemented in accordance with the DOE-approved *Rocky Flats Environmental Technology Site Implementation Plan for DOE Contractor Requirements Document, CRD 420.1 "Facility Safety"* [RFETS, 1999a]. The Criticality Safety Program includes the following processes:

- Developing CSEs for normal and credible abnormal conditions documenting the parameters, limits, and controls required to ensure the analyzed conditions are subcritical.

- Implementing limits and controls identified by the nuclear criticality evaluations.

- Reviewing operations to ascertain (a) limits and controls are being followed and (b) process conditions have not been altered such that the applicability of the CSEs has been compromised.

- Ensuring adequate criticality safety response to unplanned incidents or discovered conditions involving fissile material.

- Assessing the need for criticality accident detection devices and systems, and including such equipment where total risk to personnel will be reduced.

Facility-specific Nuclear Material Safety Limits (NMSLs), Criticality Safety Operating Limits (CSOLs) and the Criticality Safety Program apply to all Site facilities with significant quantities of fissionable materials as defined in the *Nuclear Criticality Safety Manual*. Also, the Criticality Safety Program applies to facilities with evaluations demonstrating that a criticality accident is incredible. The Criticality Safety Program contains requirements for developing these incredibility arguments, maintaining them current through periodic reviews ensuring the assumptions and credited controls are effectively implemented.

The Criticality Safety Program interfaces with several other SMPs to maintain facility conditions and assumption as analyzed in CSEs. For example, the Radiological

Protection Program dictates requirements for containment, confinement, and/or control of fissionable materials. The IWCP is relied upon to maintain configuration control so that facility conditions are maintained as analyzed or CSEs are revised prior to a change in facility conditions. The COOP mandates compliance with NMSLs, CSOLs, and criticality safety controls. The Fire Protection Program is responsible for maintaining combustible loading within the facilities at below analyzed levels. In addition to SMPs, the Criticality Safety Program may credit the Material Control and Accountability Program for control of large fissile masses.

6.4.2 Authorization Bases Importance

The important nuclear safety attributes of the Criticality Safety Program focus on preventing the occurrence of and properly responding to an inadvertent nuclear criticality. The attributes consist of various aspects of the key elements interrelated into processes to ensure (a) all operations conducted in the facility are evaluated to determine the need for NMSLs and CSOLs, (b) unplanned incidents or discovered conditions involving fissile material are responded to by Criticality Safety personnel, and (c) compliance with NMSLs and CSOLs is maintained.

With respect to worker safety (i.e., an inadvertent nuclear criticality accident may result in serious injury or death to workers), hardware controls applicable to facility-specific CAASs may be elevated to the TSR level. The system requires proper placement of detectors as well as audible alarms and beacons. The CAAS typically relies on the LS/DW as a support system to provide annunciation.

Exemptions

Exemption RFPK-DOE-C-420.1-EX-033F was approved by the DOE, RFFO on May 24, 2001. This exemption pertains to the CAAS meeting the requirements of ANSI/ANS-8.3-1996, *Criticality Accident Alarm System*, as required by DOE Order 420.1A, *Facility Safety*. This requirement applies to all facilities with a CAAS. The exemption justification states that the identified compensatory measures ensure that personnel are sufficiently protected.

A permanent exemption EX-051, *RFETS Compliance with Outdated Revisions of Criticality Safety ANSI Standards Cited in DOE Order 420.1A*, was approved by DOE, Headquarters (HQ) on August 5, 1999 and by DOE, RFFO on September 29, 1999. This exemption pertains to the language in DOE Order 420.1A, *Facility Safety*, which requires compliance with ANSI I Series Standards that are no longer the most current versions of the Standards. The exemption requests a release from these outdated versions and permission to follow the current revisions to these Standards. The exemption justification states that application of the most current Standards improves safety by operating in the most up-to-date concepts in assuring criticality safety.

6.4.3 Programmatic Key Elements

The following key elements categorize the major topics of the Criticality Safety Program that are relied upon in AB accident analyses. The topics within these key elements are summarized in the following subsections. Additional details are provided in the *Nuclear Criticality Safety Manual* [RFETS, 2000b].

- Organization and Administration
- Criticality Safety Evaluations
- Training and Qualifications
- Operational Compliance
- Configuration Management

Organization and Administration

The K-H President accepts responsibility for the Sitewide Criticality Safety Program and delegates its implementation and administration through the EES&QP and the Engineering and Nuclear Safety and Licensing Department to the Criticality Safety Manager. This ensures that the Criticality Safety organization, which is responsible for technical, non-operational aspects of criticality safety, is administratively independent of process supervision.

The Criticality Safety Manager is responsible for (a) interpreting the criticality safety standards and ensuring procedures are developed to correctly implement those standards, (b) monitoring the program through reviews, inspections, audits, appraisals, and, where required, enforcement of corrective actions to ensure that criticality safety is not compromised, and (c) overseeing the performance of the "core" functions of the Criticality Safety organization. These "core" functions include such tasks as (a) maintaining and interpreting the *Nuclear Criticality Safety Manual*, (b) maintaining the CSE and non-compliance tracking databases, (c) determining CAAS detection parameters and fission yield estimation, (d) providing technical guidance for the design of fissionable material packaging, handling, processing, and storage equipment, and (e) maintaining the Criticality Safety Engineer and CSO qualification programs. The Criticality Safety Manager resolves conflict between the provisions of the *Nuclear Criticality Safety Manual* and other programs. For example, fissionable material is also handled, stored, and moved in accordance with Radiation Protection and Material Control and Accountability programs.

The Criticality Safety Manager interfaces with facility management both directly and through the Criticality Safety Officers (CSOs). Each facility management organization is responsible for ensuring the criticality safety of their facilities and for complying with the criticality safety requirements and procedures. These organizations are responsible for such tasks as (a) managing fissionable material under their control in accordance with criticality safety requirements, (b) appointing a CSO and ensuring he/she

has adequate authority to accomplish assigned responsibilities, and (c) maintaining a CAAS, if required. The CSOs serve as liaisons for criticality safety matters between organizations having custody of fissionable material and all other organizations. They are responsible for such tasks as (a) coordinating requests for CSEs, (b) preparing NMSL and CSOL postings, implementation plans, and deactivation plans, (c) verifying the proper placement of postings, and (d) being familiar with the CAAS.

Nuclear Operations are reviewed frequently (at least annually as required by the *Nuclear Criticality Safety Manual* [RFETS, 2000b]) to determine that the operations are still within the safety envelope established by the applicable CSEs. Facility management participates in this self-assessment program. Assessments are performance-based and include the extent to which procedures are being followed. The assessments include participation by personnel not immediately responsible for the operation and the matrixed Criticality Safety Engineers. A broader based assessment, the biennial review, is conducted by management, which uses outside consultants as appropriate. The assessment is arranged by the Criticality Safety Manager and includes an overall assessment of the implementation of the Site Criticality Safety Program.

Criticality Safety Evaluations

The purpose of a CSE is to analyze the handling and storage of fissionable material under normal and credible abnormal conditions, and to determine the limits, controls, and engineered safety features necessary to ensure that an acceptable margin of subcriticality is maintained. Evaluations range in effort from common engineering and safety judgements and simple references to national consensus standard subcritical values, to complicated validated computation of neutron interacting arrays of dissimilar systems. Criticality incredibility arguments are also documented as CSEs.

The basis and analytical approach used to derive the operational criticality limits focus on control of physical parameters that influence criticality (i.e., geometry, mass, volume, concentration of fissionable material, moderation, absorption, reflection, and neutron interaction). The control of these parameters is often required to demonstrate double contingency (i.e., at least two concurrent, independent, and unlikely events must occur before a criticality accident is possible). General control principles place the highest reliance on equipment design in which dimensions of the contained fissionable material and spacing between containers, equipment and units are limited via passive engineering controls. Where geometry control is not feasible, the preferred order of controls is other passive engineering controls, active engineering controls, and administrative controls. Full advantage is taken of any nuclear characteristics of the process materials and equipment. For active engineering controls, the design of process and equipment uses the most positive practical method to prevent a criticality accident. The following methods are listed in order of decreasing safety assurance: geometrically favorable equipment, fixed poisons, blanks, instrumentation, administrative controls, and soluble poisons. Administrative controls are used as the primary controls only when no practical design measure is available and should be few, simple, and directly controllable.

Implementation plans are developed to implement the limits and controls required by the CSE and deactivation plans are required to remove limits from use. These plans address required changes and actions, responsibilities, schedule, verification of completed actions, and effective date. Independent review, concurrence by the Criticality Safety Engineer, and approval by facility management are required for both types of plans. A traceability matrix, which tracks all of the credited controls from the CSE to the method used to implement those controls, is included in implementation plans.

Training and Qualifications

The Criticality Safety Manager develops a documented qualification program for Criticality Safety Engineers and CSOs. The program for CSOs requires concurrence with operations management. The components of the qualification program for Criticality Safety Engineers includes, at a minimum, (a) education in an appropriate technical discipline, (b) relevant experience, (c) authoring or reviewing evaluation or analysis reports, (d) continuing education requirements, and (e) periodic requalification. The expertise, topics, and depth of required knowledge is appropriate to the complexity of criticality safety in the specific facilities. The CSO qualification incorporates elements of items (b), (d), and (e) above.

Operational Compliance

Situations, which are found to be out-of-specification with criticality safety requirements, are expected to be (a) promptly corrected, (b) underlying causes determined, (c) corrective actions tracked to completion, (d) recurrence prevented, (e) lessons learned transmitted, and (f) occurrences trended for systemic issues. Upon discovery of a non-compliance, facility management (a) takes action to stop work in the affected area, (b) alerts personnel to remain clear, (c) notifies facility management (as specified in the *Nuclear Criticality Safety Manual),* and (d) initiates actions to prevent altering the configuration (e.g., geometry, reflectors, moderators) of the fissile material.

Non-compliances are categorized as deficiencies or infractions depending on safety significance. A deficiency is a non-compliance with a Criticality Safety Program requirement, which does not involve loss of a contingency. An infraction is the loss or substantial degradation of a credited contingency for a criticality accident scenario or the lack of a limit or control where one is required for double contingency protection.

Postings

A criticality safety posting is a sign and a job aid that (a) indicates the presence of or potential for fissionable material, (b) summarizes key criticality safety requirements and limits, (c) designates work and storage areas, or (d) provides instructions to personnel. The content of a posting contains brief phrases and numbers in an easily readable format. Clear, unmistakable posting of work and storage areas is a very important measure in avoiding an accumulation of unsafe quantities of fissionable materials. The Criticality Safety organization writes the evaluation document that identifies the necessary NMSLs and CSOLs. The limits are implemented by facility

management, using postings as one means of communication. The postings are prepared and placed by facility management, in accordance with the *Nuclear Criticality Safety Manual* [RFETS, 2000b]. The CSO authorizes covering, removal, relocation, or editorial change of criticality safety postings. Facility management periodically reviews areas to recommend eliminating extraneous postings.

Implementation and deactivation plans for postings are developed under the direction of the CSO for implementing or deactivating, respectively, limits and controls from an CSE or Criticality Safety Limit Examination Program review. [Note: These reviews were implemented with the 1996 revision of the *Nuclear Criticality Safety Manual* and are being replaced with CSEs, as applicable.] Implementation plans address removal of superseded postings and the placement of the new posting. Implementation plans also address other items such as (a) specifying procedures that require updating, (b) verifying equipment status, and (c) providing training on the new limits. The plan includes a traceability matrix to detail how each administrative and engineered control is implemented and verified.

Deactivation plans address removal of deactivated postings and address those actions necessary to ensure that deactivation of the evaluation and/or posting does not create a non-compliant condition. It may also address other items such as (a) specifying procedures that require updating and (b) providing training on any operational impacts. Implementation and deactivation plans are both processed through the Independent Safety Review Committee (ISRC) and are approved by the CSO, Criticality Safety Engineer, and Responsible Manager.

Labeling

Safe operations require that containers with fissionable material are clearly labeled and that information needed to comply with NMSLs and CSOLs and other criticality safety controls is available, when required. The most straightforward way of accomplishing this requirement is through the use of labels that accurately indicate the fissile material type and quantity. Containers and packages containing non-exempt quantities of fissionable material are labeled to identify the contents as being fissionable material. Information needed to ensure compliance with the NMSLs, CSOLs, and other criticality safety controls may be listed on the label or are readily available (i.e., in the workspace) to the Fissionable Material Handler prior to commencing work with the material. The label itself is not required to be affixed to an inline fissionable material container provided that appropriate labeling appears on the glovebox exterior such that operations can readily determine glovebox fissionable material contents. However, the label is affixed to the container once it is removed from the glovebox line.

Training

Criticality safety training is required for those who manage, work with, or work near fissionable materials where the potential exists for a criticality accident. All criticality safety training is developed and conducted in accordance with the Site training requirements (see Section 6.16). The type, depth, emphasis, and quantity of training are

dependent on the person's duties and position. Specific topics addressed within the various types of training are provided in the *Nuclear Criticality Safety Manual* [RFETS, 2000b].

All personnel at the Site, including visitors and vendors, receive an overview of criticality safety appropriate to their nearness to fissionable material or the CAAS. The content of this overview includes (a) the importance of not moving or handling fissionable material without the required training, (b) how to recognize fissionable material by signs or labels, (c) emergency procedures pertaining to criticality safety including familiarization with the evacuation signal, (d) health effects of criticality accidents, and (e) activity-specific training requirements for criticality safety.

Formal classroom training in the fundamentals of criticality safety is provided for those personnel actively involved with fissionable materials (i.e., handling, direct supervision or engineering, or support functions). Fissionable Material Handlers are provided with training commensurate with the degree of responsibility and complexity of the work. Fissionable Material Handlers include persons who may be assigned to handle, process, store, clean up, or transport significant quantities of fissionable materials. This work category includes persons who control equipment used to produce, process, transfer, store, or package significant quantities of fissionable material. Following the completion of the fundamentals training, Site specific classroom training is provided for Fissionable Material Handlers. Subsequent to the completion of this classroom training, activity-specific training is provide by direct supervision to ensure knowledge of the applicable criticality safety practices as they relate to daily activities. Activity-specific training is conducted before a new operation is undertaken and periodically thereafter to assure personnel competency to perform the particular operations. The training includes review of the pertinent NMSLs, CSOLs, and other criticality safety controls for the activity as well as facility policy for the use of checklists, sign-off sheets, and documentation in the execution of procedures.

Supervision, design personnel, and other individuals responsible for or directly involved with the management and oversight of fissionable materials are provided with detailed knowledge of the concepts of criticality safety and the interaction of Site organizations pertinent to the Criticality Safety Program. Following the completion of classroom training in the fundamentals of criticality safety, Site-specific classroom training is provided.

Support personnel that are included in the criticality safety fundamentals training include maintenance personnel regularly assigned to a facility, Radiological Control personnel, Material Control and Accountability personnel, fire fighters, and other individuals deemed to be in this category by facility management. Following the completion of the fundamentals training, Site-specific classroom training is provided for support personnel. Subsequent to the completion of the classroom training, activity-specific training is provided by direct supervision.

The training organization maintains the central record system of personnel training status. Personnel training records are retained for a minimum of four years after

the person is no longer employed. Site Project and facility managers have access to summary training records for each employee and it is their responsibility to ensure that assigned operational staff, including Fissionable Material Handlers:

- Understand the criticality safety requirements established for the operation and handling of fissionable material, and perform such operations in strict accordance with those requirements;
- Understand and follow criticality accident emergency procedures;
- Complete the prerequisite criticality safety training and qualifications prior to handling fissionable material;
- Understand their responsibility to ask appropriate criticality safety questions and to communicate concerns to responsible management, CSOs, Criticality Safety Engineers, and co-workers, as appropriate.

Storage, Transfers, and Transportation

The design of SSCs intended for the storage of fissionable material comply with the Site design criteria, which are reviewed by the Criticality Safety Manager. Storage facilities are designed to prevent an unacceptable rearrangement of the fissionable material due to design-basis accidents, such as fire, flood, or earthquake. Where sprinkler systems are installed in fissionable material storage areas, consideration is given to the possibility of criticality occurring in an accumulation of run-off water. Fissionable material container design maintains the evaluated geometry of the container.

All fissionable materials are stored in order to prevent displacement, to ensure spacing control, and to meet design specifications for criticality safety. Storage is conducted in accordance with approved process limits. Precautions are taken to avoid entry of water or other moderating materials in storage areas where moderating and reflecting effects of such materials are an established criticality safety control. Storage racks are designed to provide a geometrically favorable arrangement of the fissionable material, thereby reducing reliance on administrative controls. Over batching is considered in storage safety analysis and in developing operating procedures. Storage racks and shelving are sturdy and noncombustible. Access to storage areas is controlled.

Work control documents are used for storing fissionable material that specify necessary limits; for example, on the total quantity of fissionable material, allowable quantity of individual units, allowable container types or dimensions, and required spacing for containers in storage. Work control documents control the removal of fissionable material from storage and the return of such material to storage.

The transportation of significant quantities of fissionable material on and off Site are controlled. For detailed transportation requirements, consult the *Site Transportation Safety Manual* [RFETS, 2000c] and specific Site procedures. The Criticality Safety

organization reviews and concurs with Site procedures associated with the receipt, packaging, handling, storage, and transport of fissionable material.

Criticality Accident Alarm System

The purpose of a CAAS is to detect excessive radiation indicating that a criticality accident has occurred. The basis for providing this system is to alert personnel, within the coverage area, with an alarm that will prompt timely evacuation, thus limiting radiation exposures. The CAAS annunciation may be audible or visual but must provide sufficient annunciation in all areas to be evacuated. Field observation of the sound level of the CAAS are performed in areas following any modification to the system or facility which may affect the audibility as determined by the operations manager, or equivalent. Areas with high noise levels are supplemented with visual alarm signal.

A CAAS is installed and maintained operational for all facilities in which the quantities of fissionable material to be handled, processed, or stored may exceed 700 g of Uranium-235, 450 g of Plutonium-239, 450 g of any combination of these two isotopes, or the safe mass limits specified in ANSI/ANS-8.15 and the occurrence probability for an inadvertent criticality event is greater than 10E-6/yr, based on quantitative analysis or engineering judgement. In addition, evaluation for the need for CAASs are made for all processes in which neutron moderators or reflectors, more effective than water, are present or where unique material configuration exist such that critical mass requirements may be less than the typical subcritical mass limits noted above. The design requirements and limited exceptions for CAASs are provided in the *Nuclear Criticality Safety Manual.*

Emergency Response and Fire Fighting

The *Site Emergency Plan* [RFETS, 1999b] and emergency procedures (see Section 6.6, *Emergency Preparedness*) govern the responses to operational emergencies at the Site. Assembly areas and personnel accountability systems have been established. Assembly areas for use by evacuating personnel in the event of a criticality are designated outside the areas to be evacuated and are a sufficient distance or provide protection to minimize further exposure.

Facilities with CAASs have emergency plans, procedures, and capabilities to respond to credible nuclear criticality accident. The Criticality Safety organization assists in the development of the Site and facility emergency plans and participates in the response to and the recovery from a criticality event. The plans and procedures address (a) evacuation, assembly, and accountability of personnel, (b) care and treatment of injured and exposed personnel, (c) drills and training of personnel, (d) recovery procedures, (e) accident response personnel requirements, (f) re-entry requirements, and (g) off-Site emergency response coordination. The plans include the requirement for a Site triennial criticality event drill.

The Site Fire Department prepares facility pre-fire plans which contain criticality safety fire fighting restrictions. Facility management assists the Fire Department in

preparing the facility pre-fire plan, reviewing the plan, and notifying the Fire Department of changes in the facility that affect fire fighting activities. Facility management and the Criticality Safety organization assist the Fire Department in maintaining the facility fire-fighting program. Facility management periodically reviews the pre-fire plan to ensure that the program remains current.

In the event of a fire, personnel observe the restriction on the use of water as indicated in the pre-fire plan unless specific authorization from the Incident Commander is obtained at the time of the emergency. Any facility that has restrictions on the use of water for fire fighting must include the restrictions as part of the routine criticality safety training for that facility. Fire fighters receive activity specific criticality safety training, including facility pre-fire plans, and the special hazards and restrictions for fire fighting in areas containing fissionable material.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. The Criticality Safety Program relies on Engineering, IWCP, and Configuration Management Programs to manage design and change control requirements for engineered safety features related to criticality safety, such as CAASs, facility equipment design that may affect fissionable material operations (e.g., criticality drains, tank design, and construction), and facility modifications that may affect CAAS detector locations. Also, a CSE may credit specific characterization and configuration implemented by NMSLs/CSOLs to ensure double contingency. When a design or process configuration change is anticipated, the CSO is contacted. The CSO in conjunction with the Criticality Safety organization coordinates criticality safety review of the change and ensures the proper documentation and approvals are obtained.

6.4.4 References

RFETS, 1999a *Rocky Flats Environmental Technology Site (RFETS) Implementation Plan for DOE Contractor Requirements Document (CRD), CRD 420.1, "Facility Safety,"* Revision 2, Rocky Flats Environmental Technology Site, Golden, CO, December 1999

RFETS, 1999b *Site Emergency Plan*, EPLAN-99, Rocky Flats Environmental Technology Site, Golden, CO, December 15, 1999.

RFETS, 2000a *Site Transportation Safety Manual*, MAN-T91-STSM-001, Revision 0, Rocky Flats Environmental Technology Site, Golden, CO, March 16, 2000.

RFETS, 2000b *Nuclear Criticality Safety Manual*, MAN-088-NCSM, Rocky Flats Environmental Technology Site, Golden, CO, November 2000.

6.5 DOCUMENT MANAGEMENT

The Document Management Program addresses the generation of specific, accurate, and consistent documents to ensure activities at the Site are conducted in a safe and consistent manner complying with appropriate regulations. This program provides the framework to ensure that personnel are knowledgeable of the hazards and appropriate responses to upset conditions when using the specified documents. A result of this program is that the appropriate collective knowledge of technical, safety, and operations professionals is provided to the worker for the performance of specific proceduralized activities.

6.5.1 General Program Description

The Site Document Management Program is described in the *Site Documents Requirements Manual* [RFETS, 2000], which provides the overall methodology and requirements for controlling and developing specific Site documents. The objective of the *Site Documents Requirements Manual* is to define the minimum requirements for the development and maintenance of document types based on applicable standards and good business practices. It also defines organizational roles and responsibilities for the Document Management Program.

The *Site Documents Requirements Manual* defines the basic processes associated with various document types for (a) developing new documents, (b) changing or canceling existing documents, (c) ensuring documents are properly reviewed and comments are dispositioned, (d) verifying and validating documents, (e) identifying *Site Documents Requirements Manual* training requirements, and (f) periodically reviewing the documents to ensure the information is accurate and current. The *Site Documents Requirements Manual* also provides a Site Document Hierarchy to assist the Responsible Manager in choosing the proper document type for development based upon the requirements for the document, the appropriate level of compliance required, risk, and graded approach. The Responsible Manager also ensures the document selected satisfies the needs of the user and the Responsible Manager.

The following CFRs and DOE orders are applicable to this section. The listed documents provide the technical basis for document development and include the requirements from which the *Site Documents Requirements Manual* [RFETS, 2000] was developed.

- 10 CFR 830, *Nuclear Safety Management* [CFR, 1995]
- DOE Order 4330.4B, *Maintenance Management Program* [DOE, 1994]
- DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities* [DOE, 1992]

- DOE Order 414.1A, *Quality Assurance* [DOE, 1999]

The Site-level documents (i.e., policies, management directives, manuals, procedures, technical engineering standards, work instructions, and job aids) are managed per the requirements in the *Site Document Requirement Manual.* These programmatic requirements also encompass documentation generated by the policies, management directives, manuals, procedures, technical engineering standards, work instructions, and job aid developed in accordance with the *Site Document Requirement Manual.* However, many other types of documents used at the Site are generated based upon unique SMP requirements. Adherence to these SMP requirements ensures that these SMP-specific documents are developed and controlled to a level sufficient to demonstrate SMP adequacy. These SMP-specific documents are discussed below.

The Conduct of Operations Program (see Section 6.2) uses various types of documents to communicate and display information. These document types include Standing Orders, Shift Orders, Night Orders, Operations Orders, and Operator Aids. These document types are managed as specified in the *Site Conduct of Operations Manual.*

The Criticality Safety Program (see Section 6.4) used various types of documents for determining and implementing criticality safety requirements. These documents include CSEs, supporting calculations, postings, implementation plans, and deactivation plans. When a limit or evaluation revision is anticipated, the CSO is contacted. The CSO coordinates the limit or evaluation request with the Criticality Safety organization. The Criticality Safety organization follows established procedures to provide evaluations and limits to support requests from the operating organization. These procedures specify requirements for the report content, quality, reviews, and approvals, as well as document control, distribution, and retention. Evaluation revisions and changes require another evaluation report with a different report number. The Criticality Safety manager ensures that the evaluation and its supporting documentation are maintained as long as the evaluation is valid. Long term retention of these records are filed and controlled in accordance with Site requirements.

Design documentation is specified and controlled through the Engineering Program (see Section 6.7). This documentation (including Site drawings, Site engineering standards, Site specification, engineering design packages including Test Procedures contained in the engineering design packages, calculation, and other related documents) is managed through the Engineering Department's Site Design Document Control.

For the Fire Protection Program (see Section 6.9), the FPE organization is responsible for the development of FHAs and the calculations that support the FHAs. These documents are managed through the Engineering Department's Site Design Document Control.

The Radiological Protection Program is responsible for generating and maintaining many types of documents, such as radiological work permits, contamination

surveys, source calibration documents, ALARA goals, and calculations. Radiological safety work control documents are developed and controlled using the Site Document Management System (see Section 6.4). However, specific Radiological safety documents have additional requirements for promulgation and control. Document management for the documents is governed by 3-PRO-212-RSP-18.01, *Guidance for Management of Records in Radiological Safety.*

6.5.2 Authorization Bases Importance

The Site AB accident analyses place significant emphasis on well-developed and approved procedures used for performing activities that may result in hazardous material release or contamination. Thus, the AB-important attributes of the Document Management Program consist of various aspects of the key elements interrelated into processes to (a) designate organizational responsibilities for developing and implementing procedures and (b) control changes to approved procedures. Procedures ensure identified hazards are adequately controlled and activities are performed in a consistently predictable fashion.

Personnel performing work in a facility have the potential to negatively impact facility safety through errors of omission (not doing something) or commission (doing something improperly, or not allowed or expected). One means of reducing these types of errors is to perform work with procedures. Establishing a process and organization to develop procedures ensures that procedures are properly developed and easily understood.

6.5.3 Programmatic Key Elements

The key elements categorize the major topics of the Document Management Program that are relied upon in AB accident analyses. However, since AB accident analyses rely on the significant contribution of procedures to nuclear safety, the information summarized for these key elements will be focused on procedures.

A procedure is a written document that sets forth the responsibilities and methodologies for performing an activity and includes step-by-step instructions for performing a task in a consistent and safe manner. A procedure may contain written instructions to conduct operations, evolutions, tests, or to respond to abnormal or emergency situations. There are basically two types of procedures, technical and administrative. A technical procedure is required for complex activities (a) requiring detailed steps and information, (b) involving the protection of equipment, workers, public, or environment, (c) having moderate to high potential for risks, hazards, and consequences, and/or (d) requiring documentation of compliance with DOE orders, regulations, statutes, codes, laws, and standards. An administrative procedure is defined as being applicable to any activity not meeting the requirements for a technical procedure. Additional details are provided in the *Site Documents Requirements Manual.*

- Organization and Administration
- Technical Content Development
- Verification and Validation
- Document Control
- Training and Qualification
- Periodic Review
- Configuration Control

Organization and Administration

The K-H President accepts responsibility for the aspects of the Sitewide Document Management Program associated with procedures and delegates its implementation and administration through the Administration Project and its Records Management organization to Records, Documents and Administrative Services Department. However, the Responsible Managers (within the Site Project organizations) and the Records, Documents and Administrative Services Manager share the responsibility for procedure development and implementation. The Records, Documents and Administrative Services Manager is responsible for overall administration of the Document Management Program, including:

- Establishing, implementing, and maintaining the Document Management Program,
- Maintaining and publishing a current Organizational Points of Contact list,
- Ensuring that approved procedures and subsequent changes are distributed to Site personnel,
- Ensuring that a comprehensive quality check is performed on each procedure,
- Ensuring that Document History files are appropriately protected, maintained, and archived, and
- Ensuring notification of Responsible Managers when Periodic Reviews are due.

Technical responsibilities, such as technical content development and peer review are discharged by responsible management within the Site Project and technical support organizations; specific responsibilities are dictated by the objectives, scope, affected facility(ies), and technical requirements of activities addressed by individual procedures. Thus, the Responsible Managers are responsible for:

- Quality, accuracy, usability, and compliance of procedures,
- Assignment of individuals to act as writers and SMEs, and ensuring they are properly trained,
- Coordination of activities of personnel assigned to develop, modify, and review procedures,
- Identification of necessary organizations and/or individuals to review and concur with procedures and changes,
- Approval (or referral to other approval authority) of new, changed, and canceled procedures,
- Cancellation of procedures when no longer needed, and
- Notification of Document Control when responsibility for a procedure changes.

The development of procedures also interfaces with the COOP, IWCP, Nuclear Safety, and QA Programs as appropriate to the respective responsibilities of each program. The QA Program mandates that documents be prepared, reviewed, approved, issued, used, and revised to prescribe processes, specify requirements, or establish design and that records must be specified, prepared, reviewed, approved, and maintained. The Nuclear Safety Program ensures that new and revised procedures are evaluated against the appropriate AB documents to determine the impact of the procedure or revision on the safety envelope. Procedure development interfaces with the COOP to ensure operational experiences, lessons learned, facility changes, and requirement changes are incorporated into existing and new procedures

Technical Content Development

Once a procedure is selected as the correct document type for the activity or task being performed, then consideration is given to the technical content required in the procedure. The Responsible Manager ensures complete and accurate technical information is provided as the basis for a procedure and the technical-basis documentation is included in the document history file. The technical information contained in procedures is based on the same operational data and analyses that were used in establishing the safety envelope.

The process for establishing the technical basis involves researching and planning the content of the procedure. The extent of research and planning depends on the complexity of the activity or task and whether the procedure is new or is being revised. As a minimum, the technical basis should include the basic operation, the real/potential hazards of the operation, and the hazard controls of the operation. The SMEs are used to ensure that criteria and standards are adhered to, and are effectively and consistently applied.

Several types of technical reviews of a procedure may be performed after development of the procedure. The review process may include an internal and editorial review, and must include a parallel or external review of technical content, an USQ process evaluation, and an ISR. The post-development review is also coordinated with IWCP so that requirements determined during the Job Hazards Analysis (JHA) are properly incorporated into the procedures. The Responsible Manager determines the type of reviews required for a procedure. This determination is documented in the procedure history file.

The internal review is used to evaluate the technical basis, correctness, and usability of the procedure, and to ensure the organization's requirements are being met. The Responsible Manager determines and designates the individuals responsible for conducting an internal review. Individuals with an intimate knowledge of the activity or task being performed are typically chosen for internal reviews.

The parallel or external review is conducted to ensure the adequacy, correctness, and completeness of the procedure, and to meet document development requirements. The Responsible Manager selects external review organizations affected by the procedure or other reviewers who have discipline-specific expertise necessary to ensure that the procedure is accurate and usable. Documentation of external review and the concurrence of the reviewing organizations are placed in the procedure history file.

The purpose of reviewing a procedure through the USQ process is to determine the impact on ABs (e.g., procedural changes do not require prior DOE approval, as long as these changes do not explicitly affect the AB of a facility or result in an operational control change). These reviews are performed in accordance with the Sitewide procedure governing the USQ process. New, revised, intent changed, and canceled procedures are required to be evaluated through the USQ process.

The primary purpose of an ISR is to identify nuclear safety issues that could affect the safety envelope, safety equipment, worker safety, public safety, or environment. New, revised, intent change, and canceled procedures are required to have an ISR performed in accordance with the Sitewide procedure governing the ISR process.

Verification and Validation

Procedures are required to be verified and validated. A verification review is a table-top review used to ensure that the procedure includes the necessary information and that it is correct and accurate. New technical procedures are required to undergo a verification review, while administrative procedures and revisions/changes to technical procedures undergo a verification review only when determined by the Responsible Manager. The following items are normally considered during the verification review: (a) operational safety analysis, operational controls, and OSHA applicability; (b) ability to complete the task as written; (c) accurate directions for form completion; (d) complete, correct, and available references; and (e) complete and accurate history file package. Verification documentation is maintained in the procedure history file.

A validation review is performed to confirm the usability of the procedure. The validator, assigned by the Responsible Manager, performs a simulated or actual walkdown of the procedure to determine whether it can be correctly, safety, and effectively performed. New technical procedures are required to have a full validation review performed prior to being approved. A validation review for revisions/changes to technical procedures or for new, revised and changed administrative procedures is optional. A Validation Checklist is completed for validation reviews and is maintained in the history file.

Document Control

The *Site Documents Requirements Manual* [RFETS, 2000] requires that approved procedures be maintained and issued by document control personnel. The *Site Documents Requirements Manual* requires that procedures at the Site are handled, issued, distributed, used, maintained, and destroyed as "controlled documents" in accordance with document control requirements. Specifically, a Document Change Form (DCF) is initiated whenever a new procedure, revision, change (major or minor correction), or cancellation to a procedure is required. The DCF serves as a control for tracking the modification to the procedure through the process and as the vehicle to record and document specific information that needs to be retained and added to the document history file. Forms, appendices, and check sheets originated during the procedure development process are completed and retained as quality assurance records in accordance with applicable quality assurance records management requirements. The *Site Documents Requirements Manual* and its implementing procedures identifies quality assurance records that may be generated during the development process.

The Site procedures can either have Sitewide, multi-building/location or single building/location applicability. Those procedures that have multi-building/location applicability have the buildings/locations identified on the procedure. Affected facility managers for these types of procedures are required to review and approve it. Any changes to an approved multi-building/location procedure must undergo review and concurrence by facility managers who have authorized implementation of the procedure in their area before approval of the change. When a multi-building/location procedure is no longer applicable to an area, the Responsible Manager for that procedure ensures the affected building/location is removed from the procedure.

Training and Qualifications

The Responsible Manager, facility manager, and/or the organization manager determine the training requirements and methods for developing and revising procedures. Additional information, which determine the training requirements and identifying the most effective methods, is provided in applicable Site training manuals. Training for procedure implementation is accomplished using the Training Program (see Section 6.16 of this chapter).

Periodic Review

The periodic review is conducted to ensure procedures accurately and adequately identify hazards associated with the work activity and satisfies current technical and administrative requirements and guidelines. The frequency of the periodic review is dependent on the activity or function of the procedure and external requirements. Records, Documents, and Administrative Services notifies the Responsible Manager when periodic review is needed. A periodic review is performed any time an inactive procedure is reactivated.

Configuration Control

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. Configuration Control of a procedure is accomplished using a DCF. This process is based upon the key elements discussed above and summarized as follows. When a need for a document change is identified, a DCF is completed describing the requested change. The Responsible Manager approves the DCF and determines the necessary reviews. The SME revises the procedure or redlines the effected pages, as appropriate. The appropriate reviews are conducted (internal, external, and/or special as defined by Responsible Manager) and comments resolved. Concurrence is obtained from reviews and the Responsible Manager approves the final DCF and controlled distribution is performed. Additional information about these processes is contained in the *Site Documents Requirements Manual.*

6.5.4 References

CFR, 1995 — *Nuclear Safety Management*, 10 CFR 830, Code of Federal Regulations, Office of Federal Register, January 1, 1995.

DOE, 1992 — *Conduct of Operations Requirements for DOE Facilities*, DOE Order 5480.19, U.S. Department of Energy, Washington, D.C. May 18, 1992.

DOE, 1994 — *Maintenance Management Program*, DOE Order 4330.4B, U.S. Department of Energy, Washington, D.C., February 10, 1994.

DOE, 1999 — *Quality Assurance*, DOE Order 414.1A, U.S. Department of Energy, Washington, D.C., September 29, 1999.

RFETS, 2000 — *Site Document Requirements Manual*, MAN-001-SDRM, Rocky Flats Environmental Technology Site, Golden, CO, May 31, 2000.

6.6 EMERGENCY PREPAREDNESS

The Emergency Preparedness Program establishes the Sitewide and facility-specific emergency response requirements to hazards as defined in the hazards basis of the Site SAR [RFETS, 2000b] and facility-specific AB documents. Emergency planning is founded in the Emergency Preparedness Hazards Assessments (EPHAs) for facilities and operating systems containing hazards that, when involved in an upset condition, could result in the declaration of an operational emergency. Emergency operations are established from the hazard analysis and planning basis to provide the infrastructure to respond to events involving the identified hazards. Emergency operations include the Site Emergency Response Organization (ERO) and off-Site interfaces through agreements and joint response requirements. The capability for emergency response is tested periodically through a formal drill and exercise program, both at the Sitewide and facility levels.

6.6.1 General Program Description

The Emergency Preparedness Program provides the planning, procedures, and resources necessary to respond to all emergencies at the Site. The program is based on a comprehensive understanding of the hazards and potential radiological and hazardous material release mechanisms present in each facility. Emergency preparedness supplements and depends on engineered features and systems as well as the other SMPs such as Environmental Management, OS&IH, Fire Protection, and Radiological Protection Programs.

The Emergency Preparedness Program incorporates planning, response and coordination with all Site functional agencies; DOE, RFFO; State of Colorado; and off-Site municipal emergency response agencies. The organization for emergency response includes representation from each of these components.

Sitewide emergency response guidelines and programmatic responsibilities are addressed in the *Site Emergency Plan* [RFETS, 1999]. This plan addresses the programmatic requirements for planning, response, and support to the Emergency Preparedness Program as defined in DOE Order 151.1, *Comprehensive Emergency Management Program* [DOE, 1995]. The *Site Emergency Plan* identifies the Site ERO, including the components for field response, command and control, Functional Work Center support, and specialized response teams. The requirements for notification of on-Site response personnel and off-Site response agencies are stipulated in the *Site Emergency Plan* and its implementing documents. The plan also includes the basis for command, control, and communications for emergency response.

Facility specific emergency response guidelines are included in the *Facility Emergency Preparedness Program Manual* (FLEPPM) [RFETS, 2000c]. The FLEPPM addresses the facility level emergency preparedness program implementation, to include the requirements for the conduct of periodic facility drills and exercises, designation and

training for the facility ERO, and reporting on program status. Much of the FLEPPM addresses issues raised during tracking and trending of emergency preparedness issues during evaluated facility exercises, and proficiency improvements as a result of the DOE complex-wide assessment of emergency preparedness, conducted in 1998. Building Emergency Response Operations (BERO) procedures for each facility are established as required by the *Site Emergency Plan.* The technical basis for each BERO procedure is the EPHA established for the specific facility, and the associated Emergency Action Levels (EALs) that identify the conditions for operational emergency classification and protective actions. The BERO addresses the facility-level emergency response requirements.

The Site Emergency Preparedness Program has undergone several audits and assessments over the last four years related to complex-wide corrective actions to actual events. DOE Headquarters (EH) conducted a programmatic assessment in June 1998, as part of the review of the complex program implementation from issues raised at the Hanford facility. An operational emergency at Hanford brought to light problems in emergency event classification, notification, response, and facility program implementation. Results of this assessment RFETS were for the most part positive. The RFETS program was praised for its interface and coordination with offsite agencies and municipalities. Issues included:

- Joint Information Center requirements needed improvement, including the identification of responsibilities for the DOE/contractor contingent to the offsite Joint Information Center operations.

- Facility level emergency preparedness program implementation required improvement, to include general knowledge by building management on EALs and emergency classification guides, and emergency response procedures.

- Proficiency on emergency actions demonstrated by some of the ERO members required improvement.

A detailed corrective action plan was developed regarding the EH assessment findings. This corrective action plan established 39 corrective actions, all of which have been completed as of September 30, 1999. Facility management believes that the program is fully implements in the facilities and reflects the requirements of the *Site Emergency Plan* and the implementing procedures. The combined programmatic, performance and independent assessments in this area suggest a fully implemented, robust program. Individual issues related to performance during facility exercises are addressed in the annual facility exercise program according to the provisions of the FLEPPM. Any issues identified during facility assessments will be enters into Plant Action Tracking System (PATS) and tracked to closure. None of the individual or collective weaknesses currently identified indicate a programmatic deficiency within the facilities.

6.6.2 Authorization Bases Importance

The important nuclear safety attributes of the Emergency Preparedness Program focus on ensuring that a formal emergency response capability is maintained because emergency response actions mitigate the consequences of accidents that occur in a facility, particularly for workers. The baseline requirements consist of various aspects of the key elements interrelated into processes to (a) maintain an approved BERO procedure, (b) identify and train emergency response personnel, (c) evacuate personnel, (d) ensure communications to emergency personnel, and (e) account for all personnel during an evacuation.

Assessment of worker consequences for spills, fires, explosions, and other events consistently assumes worker evacuation from the scene of the accident. The BERO procedure identifies worker responses to all of these types of events. Also, authorized personnel using approved procedures to respond to and minimize the spread of radiological/hazardous materials resulting from spills, fires, explosions, and other events reduce the consequences associated with these types of events. Facility evacuation in the event of an incident or spill reduces the number of potential receptors to the consequences and is an assumption in nuclear safety analysis dealing with the immediate worker consequence assessment.

Communication capability allows notification of incident response personnel in a timely manner. Many postulated accidents are of short duration, so without relatively rapid response capability, the impact that emergency personnel have on consequence mitigation is limited. Furthermore, accounting for personnel in a facility permits an assessment of the number of individuals who may still remain in a facility following an incident requiring facility evacuation. Based upon this information, emergency response personnel can make decisions regarding the necessity and timeliness of facility re-entry following the incident.

Notification is also accomplished to off-Site emergency response agencies through a dedicated notification telephone system that affords the DOE Order 151.1 requirement of 15-minute notification to the affected off-Site EROs. Follow-up notifications are accomplished to these same agencies as the event characteristics change, hazards consequences change, or the event is mitigated. Notifications are processed through the Emergency Operations Center (EOC)/Fire Dispatch Center (FDC) initially, and by the Classification/Notification Officer in the Crisis Support Staff during follow-up notifications. These notifications are provided to the DOE, HQ EOC; State EOC; and State and municipal dispatch centers surrounding the Site. Follow-up notifications are processed at least once per hour if no significant changes have occurred, and more frequently as changes occur.

Emergency public information is accomplished through the EOC assigned Public Information Manager and Public Information Team. News releases and Site announcements are processed through the Public Information Team. A Joint Information Center (JIC) is established and dispatched to the State EOC upon its activation. The JIC provides coordination of emergency public information release with representatives of

the State and municipal EROs. The JIC may be established on Site if the State does not activate its EOC.

6.6.3 Programmatic Key Elements

The following key elements categorize the major topics of the Emergency Preparedness Program that are relied upon in AB accident analyses. The topics within these key elements are summarized in the following subsections.

- Emergency Response Organization and Administration
- Hazards Basis
- Preplanned Emergency Response Actions
- Emergency Response Organization Training and Qualifications
- Configuration Management

Emergency Management Organization and Administration

The K-H President accepts responsibility for the Sitewide Emergency Preparedness Program and delegates its implementation and administration through the RISS Project and its Site Operations organization. The Site maintains an Emergency Management Organization (EMO) to staff the EOC upon activation during an operational emergency. The EMO consists of the Crisis Management Team, Crisis Support Staff, and Hazards Assessment Center. Staffing of the EOC during operational emergency is based on a graded approach. During an Alert Star or Alert, the Crisis Support Staff and components of the Hazards Assessment Center are activated. During Site Area and General Emergency, the entire EMO is activated.

Also, the Site maintains an Incident Command Organization (ICO) as a field element of emergency response. The ICO is headed by the Incident Commander, and staffed with first response and selected functional agencies for immediate response to the event scene. The ICO consists of representatives of the Fire Department, Security, Radiation Protection, Industrial Hygiene, and Facility Management, with other representatives as needed. The ICO follows the provisions and procedures for Incident Command stipulated by the National Fire Academy.

The Site has established Functional Work Centers to provide functional assistance to the EMO or the ICO. These Functional Work Centers include FDC, Central Alarm Station/Secondary Alarm Station, Radiation Protection, Industrial Hygiene, Engineering, Criticality Safety, Environmental, Human Resources, Occupational Medicine, Site Support Services, and Public Information Team.

Furthermore, specialized team resources are assigned to perform support activities for the EOC and ICO. These teams include the (a) Radiological Field Sampling Team,

(b) Industrial Hygiene Field Sampling Team, (c) Radiological Assistance Program Team, and (d) DOE, RFFO representative to the North Region Incident Management Group and State Emergency Operations Center (SEOC). The field sampling teams are assigned hazards monitoring duties specific to the Site. The Radiological Assistance Program Team is a resource assigned within DOE to provide off-Site assistance at the scene of a radiological event. The Incident Management Group is an organization composed of off-Site EROs (fire and law enforcement) to direct response of off-Site emergency response personnel and the public. The Incident Management Group includes a representative from DOE, RFFO for coordination and interface. Following declaration of an operational emergency at the Site, the SEOC may be activated at any of the operational event classifications, and likely is activated for Site Area Emergency and General Emergency declarations. The DOE, RFFO dispatches an Offsite Coordination Center (OCC) Manager and a Technical Advisor to the SEOC to provide interface with the State's Emergency Director and SEOC staff. Additionally, the OCC Manager and RFFO Technical Advisor provide assistance and information to the JIC Manager and Site Spokesperson once the JIC is established at the SEOC. This assistance provides the technical basis for development and presentation of event-related information to the media and public.

Hazards Basis

The Site SAR [RFETS, 2000b] and facility-specific ABs have identified accident scenarios and upset conditions that could impact the continuation of operations within the Site or facility. These accident scenarios and upset conditions are analyzed by the Emergency Preparedness Department to determine the consequence assessment of the potential events. This consequence assessment is reflected in the EPHAs for appropriate activities and facilities. The EPHAs are the hazards basis for emergency planning. Additionally, the consequences that would result in an operational emergency declaration are processed into EALs for the facility and are accompanied by recommended protective actions for facility workers and Site employees. The EALs represent the event emergency classification (Alert Star, Alert, Site Area Emergency, or General Emergency) that determines the level of emergency response under the Site's graded emergency response approach.

Furthermore, all EALs and their recommended protective actions are consolidated into a Site procedure use by the Shift Superintendent in the determination of event emergency classification as an operational emergency, which in turn generates the response to the event on a graded level of response. The EALs are also incorporated into facility-specific BERO procedures for use by facility management in assessing the potential impact of different event scenarios. Changes to facility conditions, hazards, or AB documents are accompanied by a change to the EPHA and EALs, as necessary. These changes are based on any changes to the AB documents, or changes resulting from the monthly material-at-risk analysis, which re-evaluates the inventory of hazardous materials for Site facilities. If no changes are required during the year, an annual review of the facility EPHA is performed and the EPHA revised accordingly to reflect any guidance changes that are needed. The EPHAs are approved by K-H and DOE, RFFO, and are provided to the Colorado Department of Public Health and Environment

(CDPHE), Emergency Management Group, for their use in determining State-level response requirements.

Preplanned Emergency Response Actions

Emergency classifications are designations for operational emergency impacts on Site and facility systems and personnel. There are four classifications used at the Site: Alert Star, Alert, Site Area Emergency, and General Emergency. Definition of each of these classifications is included in the *Site Emergency Plan*. For planning purposes, Alert Star and Alert involve an event within the facility boundary, Site Area Emergency involves an event within the Site boundary, and General Emergency involves an event beyond the Site boundary.

Protective actions are associated with the consequence assessment of events that are classified as operational emergencies. For planning purposes, K-H has established some default protective actions for events classified as operational emergencies. For Alert Star and Alert, protective actions on Site are to evacuate in the vicinity of the hazard, no other on-Site protective actions, and no off-Site protective actions. For Site Area Emergency, evacuate in the vicinity of the hazard, shelter on Site, and no off-Site protective actions. For General Emergency, evacuate in the vicinity of the hazard, shelter or evacuate on Site, and shelter or evacuate off Site (depending on assessment of hazard conditions to the worker and public).

Emergency notifications are made to on-Site and off-Site personnel to direct response actions. On Site, the LS/DW System, radios, and telephones are used to inform personnel of protective actions. Specific notification requirements are included in the *Site Emergency Plan*.

Medical Support

During an operational emergency medical support can be provided on four levels. The initial response is provided by the Building Emergency Support Team members for those facilities where one is assigned. These members normally provide immediate lifesaving steps, such as Cardiovascular Pulmonary Resuscitation and stopping bleeding. The Fire Department's certified Emergency Medical Technicians (EMTs) provide initial professional attention to on-Site personnel. These personnel are available 24 hours a day and can provide assistance within five minutes of being notified. An Occupational Medicine group is located on Site to provide medical care for less severe cases of contamination and other types of injuries. The staff consists of medical doctors, registered nurses, X-ray technicians, and support staff. At a minimum, a physician and nurse are on-call 24 hours a day, seven days a week. For those personnel that require additional care due to the extent of their injuries, hospitals in the local area are prepared to accept both contaminated and uncontaminated personnel.

The Occupational Medicine Emergency Management Plan defines the communication procedures that may be necessary during an operational emergency. This

plan is compatible with local and State emergency plans to develop maximum aid and assistance capability.

Reentry and Recovery

Reentry during a declared emergency is part of response and mitigation efforts and may include search and rescue, radiological and hazardous material control, or other life threatening activities or situations. Site procedures outlined in the *Site Emergency Plan* provide considerations and instructions for reentry operations. When possible, emergency exposures are limited to DOE occupational exposure limits and any planned exposures above DOE occupational limits are voluntary. The Crisis Manager must approve any entries to areas (a) known or anticipated to be greater than DOE Radiological Emergency Dose Limits, (b) unknown radiation fields, (c) possible toxic or radioactive atmospheres, (d) possible oxygen deficient atmospheres, (e) areas where sudden fire flare-ups, explosions, or structure collapses are possible, and (f) areas where downed power lines are present. The As Low As Reasonably Achievable (ALARA) principle is used to the extent possible to limit the amount of exposure to personnel.

When an emergency is terminated, normal operating exposure limits are reinstated and, depending on the nature of the terminated emergency, a recovery phase may be declared and appropriate notifications made. The K-H is responsible for planning and implementing recovery activities. Reentry for assessment of damage, and conditions is performed and results are included in the Recovery Plan. Before implementation, plans for recovery operations are reviewed and approved by the Recovery Manager with concurrence by the DOE, RFFO Manager. Recovery plans are also coordinated with appropriate off-Site regulatory and response agencies, including DOE, HQ.

Prior to resuming normal operations, a final briefing for the Recovery Organization, the Crisis Manager, and the DOE, RFFO Manager is held to discuss resumption operations requirements. Documentation of recovery operation activities is collected and processed for permanent storage.

Emergency Facilities and Equipment

Emergency response facilities are activated to provide direction and control, off-Site resource coordination, and public information. Each facility maintains adequate administrative supplies, appropriate procedures, records and support data, and essential emergency equipment to perform the designated facility functions. The Site emergency response facilities include the EOC, Alternate EOC, Decontamination Facilities, Functional Support Facilities, JIC, North Region Incident Management Group, and the SEOC. These emergency response facilities, equipment, and resources are described in the *Site Emergency Plan*. Implementing procedures are used to coordinate and manage emergency response, including field sampling, heavy equipment, security, decontamination, medical support, laboratory analyses, and media interface.

The emergency equipment necessary for emergency response personnel to carry out their duties is stored and maintained in an operational status. Additional equipment

and capabilities are available to support emergency response through the implementation of agreements with off-Site organizations and vendors. The DOE, RFFO Off-Site Communicator/Coordinator maintains, in the EOC, a list of Federal and State agencies which may provide additional equipment or resources upon request.

Emergency Management Organization Training and Qualification

The EMO training and qualification requirements are identified in the *Training Program Manual* [RFETS, 2000a]. The EMO training consists of an initial training course, with annual refresher training required. Participation by EMO members in drills and exercises may be credited for annual refresher training. Qualification of the EMO members is in part functionally based, and in part training based. The representatives of the EMO are predominantly assigned by functional expertise to perform the same job responsibilities applied to emergency situations. Therefore, qualification in this job specialty constitutes qualification in EMO responsibilities. Additional training is provided for qualification for specialized functions that are not functionally assigned, such as Communicator and Recorder.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. The Emergency Preparedness Program typically responds to changes in configuration of hazardous materials, potential accident sources or modifications to site boundaries and the impact of accidents on identified receptors. Emergency Preparedness relies on configuration management at the Site to ensure that changes to SSCs, equipment important to safety, and hazardous material inventories are incorporated in all aspects of emergency planning, and in particular, the EPHAs. The hazards basis for the Site or an individual facility must accurately reflect the SSCs or equipment important to safety that can be relied upon and the inventory of hazardous materials to ensure correct EALs are calculated and correct emergency response actions are planned. Inaccurate data could result in unnecessary exposure to workers because of ineffective response plans.

Configuration controls of key importance to emergency planning include the reduction, elimination, or reconfiguration of hazardous material, changes in the credited safety systems within a facility, or relocation or movement of hazardous material through intra-Site and inter-Site transportation. Additionally, any modifications to hazards on Site (either additional hazards or reduction in hazards) caused by changes in mission requirements normally require a review and validation of the existing EPHAs.

6.6.4 References

DOE, 1995 — *Comprehensive Emergency Management System*, DOE Order 151.1, U.S. Department of Energy, Washington, D.C., October 26, 1995.

RFETS, 1999 — *Site Emergency Plan*, EPLAN-99, Rocky Flats Environmental Technology Site, Golden, CO, December 15, 1999.

RFETS, 2000a *Training Program Manual*, MAN-094-TPM, Revision 0, Rocky Flats Environmental Technology Site, Golden, CO, September 18, 2000.

RFETS, 2000b *Rocky Flats Environmental Technology Site Safety Analysis Report*, Revision 2, Rocky Flats Environmental Technology Site, Golden, CO, November 2000.

RFETS, 2000c *Facility Level Emergency Preparedness Program Manual*, MAN-020-FLEPPM, Revision 2, Rocky Flats Environmental Technology Site, Golden, CO, December 15, 2000.

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6.7 ENGINEERING

The Engineering Program provides the requirements and controls for new designs and modifications to existing designs. Reviews of these activities both internal and external ensure (a) design accuracy, (b) proper application of regulatory, industry, and Site requirements, and (c) adherence to design basis and safety basis requirements. The program requires analysis of hazards involved in the affected areas through the IWCP process. Qualification requirements of Engineering Program personnel also add to the safety philosophy to maintain nuclear and criticality safety. Design documentation is also specified and controlled through the Engineering Program.

6.7.1 General Program Description

The *Site Engineering Requirements Manual* [RFETS, 2000] establishes the requirements and structure of the Engineering Program. Specific DOE and industry requirements and standards are delineated in this manual. The Engineering Program includes the following basic processes for (a) engineering personnel qualifications, (b) graded approach methodology for design performance, (c) design, including review and approval, and (d) documentation

The primary requirements documents that establish the Engineering Program are listed below.

- 10 CFR 830.120, *Quality Assurance Requirements* [CFR, 1995]
- DOE Order 414.1A, *Quality Assurance* [DOE, 1999]
- DOE Order 420.1A, *Facility Safety* [DOE, 1996]
- DOE Order 430.1, *Life Cycle Asset Management* [DOE, 1998]
- DOE-STD-1020-94, *Natural Hazards Design and Evaluation Criteria for DOE Facilities* [DOE, 1994b]
- DOE-STD-1021-93, *Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components* [DOE, 1993]
- DOE-STD-1022-94, *Natural Phenomena Hazards Characterization Criteria* [DOE, 1994a]
- DOE-STD-1023-95, *Natural Phenomena Hazards Assessment Criteria* [DOE, 1995]

6.7.2 Authorization Bases Importance

The important attributes of the Engineering Program focus on checks and balances for new designs, modifications to existing designs, and calculations. These attributes consist of various aspects of the key elements interrelated to processes that (a) identify and assess hazards, (b) verify existing as-built drawings/engineering documents through engineering personnel walkdowns on all affected SSCs prior to any design changes, (c) maintain credited safety function of SSCs through configuration control, and (d) submit to multiple levels of reviews both internal and external.

The AB analyses makes assumptions about the availability and functional operability of safety SSCs. Thus, the operation of this equipment must be maintained to ensure that the assumptions remain valid. A safety and technical review process for design modifications ensures that safety SSCs will continue to perform their credited and/or intended functions after modification of the equipment. Modifications may result in changes to system operation and/or maintenance. If so, procedures must be changed and personnel must be retrained. The AB documents must be considered for revision to reflect SSC changes. In addition, all the changes must be documented to ensure future modifications will have a valid technical basis.

6.7.3 Programmatic Key Elements

The following key elements categorize the major topics of the Engineering Program that are relied upon in AB accident analyses. The topics within these key elements are summarized in the following subsections. Additional details are provided in the *Site Engineering Requirements Manual* [RFETS, 2000].

- Organization and Administration
- Qualifications
- Design Control
- Configuration Management

Organization and Administration

The K-H President accepts ultimate responsibility for the Site Engineering Program and delegates its implementation and administration through the EES&QP and Engineering Department to the Site Chief Engineer (SCE). The SCE oversees the Engineering Programs group development and maintenance of engineering processes and has ultimate design authority. Floor level implementation is administered by Project Chief Engineers (PCEs) who are delegated authority by the SCE. The PCEs oversee organizations and contracts that perform the actual design work in their respective Site Project to maintain the safety envelope established within the AB documents. Approval of design work is the responsibility of engineering management within each Site Project. Any alternate method of design process, other than that designated by the *Site Engineering Requirements Manual*, is approved only by the SCE.

Qualifications

The Engineering Program requires that individuals performing specific engineering duties must have reached a certain level of engineering expertise including education and experience. Engineering positions are approved and documented by a specific level of management within each Site Project or by the SCE based on review of an individual's qualification. The specific positions requiring documented qualification include the designer, reviewer, verifier, Responsible Manager (engineering), peer reviewer, and specification writer. The qualification program is documented through the engineering website and is available for those seeking qualification information either for proposed design work or to verify those that have worked on previous designs.

Design Control

The Engineering Program provides a graded approach to assist the designer and responsible engineering manager in establishing the type of design activity needed as well as the level of design intensity. Requirements are established for those performing design work to ensure that the final approved documentation undergoes distinct levels of both internal and external review. A process for documenting each design activity is provided. Some of this documentation is established through the use of templates that aid the designer in methodically considering all design aspects. This method is also provided for the designer to document calculations. Industry standards are specified as well as Site specific standards to ensure necessary requirements are imposed on any proposed design. Under the design process there are also provisions for design implementation that is halted prior to completion or that will be significantly delayed. These provisions ensure that adverse conditions do not develop as a result of delayed or partially complete modifications.

Pertinent designs documents are incorporated into IWCP packages and therefore further reviewed during the IWCP process (see Section 6.10, Integrated Work Control). These design documents that are contained in an IWCP package are provided to all reviewers (i.e., SMEs from each applicable safety discipline) for their review prior to obtaining their concurrence on the IWCP package. As appropriate, the engineering personnel responsible for the new design or modified designs attend IWCP package review meetings to provide information and clarification as to the design function.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. The Engineering Program ensures that permanent physical configuration changes to SSCs are designed and authorized in accordance with Site standards and requirements. The Engineering Program ensures equipment will perform as required upon demand if maintained and operated within specified parameters. This is accomplished through the Design Control key element described above. Within the design process, the Engineering Program requires a baseline document change form (BDCF) to be completed for any design or modification. Other affected documents, such

as SARs, BIOs, System Engineering Reports, and procedures, will also be identified and revised as necessary.

6.7.4 References

CFR, 1995 — *Quality Assurance*, 10 CFR 830.120, Code of Federal Regulations, Office of Federal Register, January 1995.

DOE, 1993 — *Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components*, DOE-STD-1021-93, U.S. Department of Energy, Washington, D.C., July 1993.

DOE, 1994a — *Natural Phenomena Hazards Characterization Criteria*, DOE-STD-1022-94, U.S. Department of Energy, Washington, D.C., March 1994.

DOE, 1994b — *Natural Hazards Design and Evaluation Criteria for DOE Facilities*, DOE-STD-1020-94, U.S. Department of Energy, Washington, D.C., April 1994.

DOE, 1995 — *Natural Phenomena Hazards Assessment Criteria*, DOE-STD-1023-95, U.S. Department of Energy, Washington, D.C., September 1995.

DOE, 1996 — *Facility Safety*, DOE Order 420.1A, U.S. Department of Energy, Washington, D.C., October 26, 1996.

DOE, 1998 — *Life Cycle Asset Management*, DOE Order 430.1A, U.S. Department of Energy, Washington, D.C., October 14, 1998.

DOE, 1999 — *Quality Assurance*, DOE Order 414.1A, U.S. Department of Energy, Washington, D.C., September 29, 1999.

RFETS, 2000 — *Site Engineering Requirements Manual*, MAN-027-SERM, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, May 31, 2000.

6.8 ENVIRONMENTAL MANAGEMENT

The Environmental Management Program is focused on protecting, preserving, and enhancing the environment by complying with governing laws, permits, and compliance agreements. With respect to AB considerations, by complying with the requirements for sound environmental management, protection is provided to the public and workers. Thus, a process to identify and correct issues associated with environmental protection based on facility activities provides the knowledge needed to develop an appropriate set of controls for work activities.

6.8.1 General Program Description

The Environmental Management Program at the Site is consistent with the principles of International Standardization Organization-14000 and the Environmental Protection Agency's (EPA's) Code of Environmental Principles. This program ensures an integrated, comprehensive approach to environmental management that encompasses protection, preservation, and enhancement of the environment through continual compliance with legal requirements. The program also includes a continual improvement process for environmental performance.

The K-H management seeks to develop a culture of environmental stewardship, which integrates the concept that stakeholders recognize the potential impacts of Site activities on the environment and that Site personnel adopt practices that eliminate or reduce negative environmental impacts. This means that, while regulatory compliance is essential, it is not always enough. Thus, the Site promotes environmental caretaking and enhancement.

The Environmental Management Program is designed to integrate environmental protection into all Site activities. Such integration requires knowledge of many Federal and State regulations and how these regulations impact the activities needed for Site Closure. The IWCP process requires planners for IWCP work packages, which include activities having the potential of posing environmental impact and compliance concerns, contact Site Environmental professionals for review of these work packages to ensure environmental protection and compliance with all applicable environmental regulations. Also, environmental professionals assess off-Site waste management facilities for potential risk and liability and interface with other DOE sites for suitable storage, treatment, and disposal of Site waste. The objective of the site visits is to determine the facility capabilities, WAC, radiological limits, permit and license conditions, and schedules for availability to store, treat and/or dispose of Site waste.

6.8.2 Authorization Bases Importance

The Environmental Management Program complements AB consequence analyses with information needed to address potential environmental pathways (e.g., air,

ground water migration, surface water, soil deposition, and plants and animal uptake) for uncontrolled releases of radioactive and hazardous materials and estimating potential consequences of such releases. This is accomplished through the review and approval of an environmental checklist. Requirements for completion of a checklist are incorporated into the IWCP process.

6.8.3 Programmatic Key Elements

The following key elements categorize the major topics of the Environmental Management Program that are relied upon in support of AB accident analyses and controls related to protection and safety of the public and environment. The topics within these key elements are discussed in more detail in the following subsections:

- Organization and Administration
- Strategic Planning
- Training and Qualifications
- Configuration Management

Organization and Administration

The K-H President is ultimately responsible for the Sitewide Environmental Management Program and delegates its implementation and administration through EES&QP to the Site Projects and Environmental Systems and Stewardship (ESS) organization. These organizations include environmental professionals knowledgeable and experienced in the various environmental regulations and systems. The ESS organization ensures that crosscutting environmental issues are identified and addressed and that all Site activities receive appropriate environmental review and support. Specific responsibilities of Site Project and facility managers and personnel are detailed below.

Site Project managers are responsible for advocating, implementing, enhancing, and supporting environmental compliance and ensuring adequate resources are available to maintain compliance-assuring best management practices. The Site Projects are responsible for designing and implementing an effective environmental management strategy based on the Site program, management strategies, and the specific Site Project's scope of work. The Site Project and/or facility managers ensure that employees and contractors possess the proper environmental training for the job they are performing. The Site Projects hold employees and contractors accountable for their environmental actions.

The Site Project and/or facility managers are responsible for reviewing proposed activities for environmental compliance issues with the assistance of their assigned environmental staff. Facility managers and workers report known or suspected environmental issues and non-compliances to environmental staff, as appropriate and

provide adequate resources to correct environmental non-compliances. Suspected and known environmental non-compliances and their identified root causes and corrective actions are documented in the Environmental Compliance Action Tracking System (ECATS).

The ECATS is a database used to track environmental deficiency trends, corrective actions, and perform statistical analysis on identified issues. The ECATS also provides a mechanism for compiling and maintaining information for self-reports. The information is then used to identify areas where programs need to be enhanced, additional training delivered or additional controls implemented. The information may also be used to document continuous improvement.

Strategic Planning and Implementation

Strategic planning is an important practice within the Environmental Management Program because of the overlap of the various environmental regulations and the priorities set forth in each regulation. Planning tools are used by the Site to integrate Environmental Management priorities with other Site activities. These tools include the *Environmental Management Reference Guide* [RFETS, 2000a]; ESS Regulatory Review; Environmental, Safety, and Health Council; Environmental Leadership Team; 90-Day Look Ahead; Commitment Management System; Pollution Prevention; and the Off-Site Waste Management Program.

The *Environmental Management Reference Guide* contains overviews of environmental programs specific to thirteen different environmental media and statutory/regulatory authorities governing activities at the Site. Each section includes an (a) overview of the regulatory program, (b) brief description of the program objectives, elements and background, (c) roles and responsibilities of the Site Projects and support groups, (d) outline of the regulatory drivers and permits, and (e) summary of the document hierarchy. Of the thirteen statutory programs listed in the *Environmental Management Reference Guide*, the following are important in AB at the Site.

Comprehensive Environmental Response, Compensation, and Liability Act

The RFETS is designated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as a remediation or Superfund site. As such, Site D&D and environmental restoration (ER) activities are governed by CERCLA. Environmental contaminants, resulting from these activities, have the potential of posing risk to human health and the environment (*e.g.*, increased worker and off-Site public exposures, and contaminant migration). Hazard assessments are performed for each D&D and ER project and project-specific health and safety plans, field implementation plans, and waste management plans ensure protection of human health and the environment. Site CERCLA activities and obligations, as well as CERCLA integration with other environmental and waste programs, are coordinated and controlled via the RFCA process as described below. Public involvement procedures are incorporated into Site CERCLA decision documents identified in the *Rocky Flats Cleanup Agreement* [CDPHE, 1996].

Rocky Flats Cleanup Agreement

The *Rocky Flats Cleanup Agreement* is a legally binding agreement between the DOE, EPA, and CDPHE. The *Rocky Flats Cleanup Agreement* establishes the regulatory framework for achieving ultimate cleanup of the Site. The *Rocky Flats Cleanup Agreement* is a primary component of the Environmental Management Program and addresses applicable (a) waste management, (b) D&D, and (c) ER activities through Site Closure. The *Rocky Flats Cleanup Agreement* also addresses and incorporates various consent and compliance orders and agreements.

Air Quality Management

The Air Quality Management Program addresses compliance with State and Federal air quality regulations and air monitoring. Monitoring activities include effluent and ambient pollutant monitoring on or near the Site, meteorological monitoring, and monitoring of pollutants potentially dispersed from Site activities. Air pollutants of concern for protection of human health and the environment include radionuclides, beryllium, and other hazardous chemicals. Air quality regulatory compliance activities address (a) evaluation of new and modified emission sources, (b) establishment of air pollutant controls and (c) identification and correction of non-compliances. The Site operates under the conditions of a Clean Air Act Title V Air Operating Permit.

Water Quality Management

The Water Management Program is intended to protect human health and the environment from non-compliant and potentially harmful discharges from the Site. The Site Surface and Groundwater programs were designed to ensure compliance with regulatory and permit requirements. This goal is accomplished by monitoring water quality at the (a) Waste Water Treatment Plant, (b) influents to and discharges from the stormwater detention ponds, and (c) various groundwater locations and compliance with RFCA requirements. The Site does not discharge contaminated groundwater from the Site. Surface water discharges and groundwater plumes are routinely monitored to protect human health and the environment and to ensure compliance with regulatory permits and requirements.

Resource Conservation and Recovery Act

The Site's *Resource Conservation and Recovery Act Program Plan* [RFETS, 2000c] implements State and Federal hazardous waste regulations designed to provide "cradle-to-grave" control of hazardous and radioactive wastes. The plan is designed to ensure waste generation and waste management compliance requirements with RCRA regulatory standards, permit terms and conditions, and agency agreements and consent orders. The plan addresses programmatic and day-to-day operational waste activities requirements in addition to pollution prevention, waste minimization, and emergency preparedness and prevention activities.

The *RCRA Permit* [RFETS, 1997] and its modifications address Site activities such as WAC, waste analysis, operating procedures, emergency plans, hazards, task

management, training, treatment, quality assurance, and closure. Various agreements and consent orders also address RCRA management in accordance with Federal law.

Toxic Substances Control Act

The Site has developed a program plan addressing its strategy for safely managing all polychlorinated biphenyl (PCB). The *Toxic Substance Control Act/Polychlorinated Biphenyl Program Plan* [RFETS, 2000d] addresses the management of TSCA wastes generated prior to and during D&D, or excess property distribution activities. This plan prohibits the purchase of any new PCB-containing equipment or paint. The *TSCA/PCB Program Plan* addresses compliant waste management and disposal requirements for Site TSCA wastes to protect Site workers from the health effects of TSCA materials.

Chemical Life Cycle Management

The Chemical Management Program is a Sitewide, integrated management system that ensures the purchase, use, and disposal of chemicals compliant with applicable regulatory standards, permit terms and conditions, and agency agreements and consent orders. Two fundamental components of the Chemical Management Program are Chemical Life Cycle Management and Chemical Waste Management. Chemical Life Cycle Management addresses substances used in current mission processes or maintenance activities, while Chemical Waste Management addresses disposal of chemicals previously used at the Site. The Chemical Management Program also requires compliance with the requirements of other programs such as RCRA, Emergency Planning and Community Right-To-Know, and various Site consent and compliance orders.

National Environmental Policy Act

The Site's *National Environmental Policy Act Program Plan* [RFETS, 2000b] implements Federal NEPA regulations. This Site program is broadly designed to integrate environmental considerations early, particularly with respect to waste management, D&D, and ER project planning decisions, to ensure protection of human health and the environment during those activities. The NEPA process ensures full review of potential environmental impacts evaluated by Site personnel, including cumulative impacts from Site activities. The process assures compliance with other environmental laws such as RCRA and CERCLA. Public involvement procedures are incorporated into Site CERCLA decision documents and other specific decision documents identified in the *Rocky Flats Cleanup Agreement.*

Training and Qualifications

As indicated above, the Site Project and ESS consists of SMEs with expertise in the various environmental regulations. These SMEs have educational experience and/or specialized training in their respective subject and are expected to stay current with changing regulations. Continuous on-Site training is also required.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. The contribution of the Environmental Management Program to Site configuration management is discussed in the *Environmental Management Reference Guide.* The Chemical Life Cycle Management as discussed above is of particular interest because changes in chemical inventories may impact hazard classification of facilities as nuclear material is removed. Currently, chemical inventories have an impact on auditable safety analyses for facilities housing chemicals as addressed in the Site SAR [RFETS, 2000e]. The type and amount of certain chemicals is the basis for a hazard classification of non-nuclear moderate or low. Chemical Life Cycle Management is focused on Sitewide accumulation of chemicals; however, this ensures that individual facilities remain significantly below Federal regulation threshold quantities.

6.8.4 References

CDPHE, 1996 *Rocky Flats Cleanup Agreement*, Federal Facility Agreement and Consent Order (No. 96-07-19-01), Colorado Department of Public Health and Environment, July 19, 1996.

RFETS, 1997 *RFETS Resource Conservation and Recovery Act Part B Permit* (No. 97-05-30-01), Rocky Flats Environmental Technology Site, Golden, Colorado, May 30, 1997.

RFETS, 2000a *Environmental Management Reference Guide*, Rocky Flats Environmental Technology Site, Golden, CO, December 1, 2000.

RFETS, 2000b *National Environmental Policy Act Program Plan*, Rocky Flats Environmental Technology Site, Golden, CO, December 1, 2000.

RFETS, 2000c *Resource Conservation and Recovery Act Program Plan*, Rocky Flats Environmental Technology Site, Golden, CO, December 1, 2000.

RFETS, 2000d *Toxic Substance Control Act/Polychlorinated Biphenyl Program Plan*, Rocky Flats Environmental Technology Site, Golden, CO, December 1, 2000.

RFETS, 2000e *Rocky Flats Environmental Technology Site Safety Analysis Report*, Revision 2, Rocky Flats Environmental Technology Site, Golden, CO, November 2000.

6.9 FIRE PROTECTION

The Fire Protection Program provides a balanced approach for achieving pre-designated fire safety goals for Site facilities and workers, the public, and the environment. This basic principle, as embodied in the Fire Protection Program, provides sufficient fire protection to ensure (a) the health and life safety of the employees in the event of a fire, (b) any fire that may occur will not threaten the public health and welfare, (c) unacceptable delays in vital DOE programs will not occur, and (d) damage to DOE buildings and equipment will be maintained below specific dollar loss values should a fire occur.

6.9.1 General Program Description

The Fire Protection Program implements the requirements of DOE Orders 420.1A, *Facility Safety* [DOE, 1996] and 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees* [DOE, 1998]. The *Fire Protection Program Plan* [RFETS, 1999a] defines the requirements, organization, qualifications, and training applicable to the Site. The *Fire Protection Program Plan* is reviewed periodically to ensure it is current with DOE orders, and other applicable codes and standards. Elements of the *Fire Protection Program Plan* are implemented throughout the Site at all levels of management and workers. This is accomplished through Site procedures, facility-specific procedures, and administrative controls (e.g., facility-specific operation orders and AB documents).

Site Operations (i.e., Fire and Emergency Services and Fire System Services) and Fire Protection Engineering (FPE) Departments interface with each Site Project and/or facility to ensure adequate implementation of the Fire Protection Program requirements for protecting personnel and property from a fire or other related emergencies. The Fire and Emergency Services Department maintains an agenda that provides for (a) capable response to a fire, (b) fire prevention, (c) fire prevention training, and (d) inspections. The FPE formulates and maintains Site fire protection procedures and directives, provides design support, and enforces code requirements. The FPE is the liaison between the Engineering and Fire and Emergency Services Departments by providing fire code support during design and construction phases and assists the Fire and Emergency Services Department, facility managers, and other interested organizations with code interpretation. The Fire Protection Program supplements other SMPs such as Emergency Preparedness, Environmental Management, and Nuclear Safety at the Site.

Facility-specific AB documents define fire detection, suppression, and alarm annunciation equipment credited for accident detection and/or mitigation functions in the facility-specific accident analyses. Specific operational controls are developed to address the function of the credited equipment. When a facility-specific accident analysis does not credit fire protection systems for prevention and/or mitigation, the equipment is maintained as governed by the Fire Protection Program, which applies appropriate

consideration for worker and property protection, governed by OSHA regulation, typically in compliance with the code of record. The Fire Hazards Analysis (FHA) routinely assesses the facility, its condition and the equipment available to prevent or mitigate fire damage and protect workers from injury. Unique equipment that exceeds typical program requirements required to support an activity, or location should be included in the specific work package or AB document required to control the hazard. Typical equipment is identified in NSTR-007-01, *Site Preliminary Hazards Analysis to Support Hazard Category 2 and 3 Nuclear Facilities' Authorization Basis Development* [RFETS, 2001]. All fire detection/protection equipment will be maintained while a fire hazard exists and the equipment does not preclude completion of mission activities.

6.9.2 Authorization Bases Importance

The Fire Protection Program implements standards, limits, and program requirements that employ explicit safety functions that are either directed at specifically credited safety features or safety features recognized to be important for providing defense in depth. Thus, the Fire Protection Program protects the worker, the public, and the environment from a fire and/or other related emergencies at the Site. Safety analyses in AB documents place strong emphasis on combustible loading, ignition source control, fire safety, and fire equipment operability. These nuclear safety attributes are integrated into facility processes and activities such that they (a) minimize combustible loading by means of work control planning and housekeeping; (b) establish periodic fire inspections and tours; (c) control welding/hot work; (d) control introduction or generation of flammable gasses in the facility; and (e) control the handling and storage of plutonium and pyrophoric materials. Facility-specific implementation is based upon facility-specific hazards and accident analyses.

Specific fire systems, equipment, or design features may be credited in the safety analyses of an AB document for accident detection or mitigation. Such credited systems and equipment may then have operational parameters placed on them by the AB document in the form of LCOs and Surveillance Requirements (SRs). Design features are usually passive in nature and thus, are normally controlled through configuration management programs and periodic inspection. When operation of a credited device is determined to be outside these imposed parameters, specific LCO Required Actions, delineated in the AB, must be performed to maintain accident analyses assumptions, thus protecting the worker, the public, and the environment. Systems and components are maintained to the requirements of DOE orders, and national standards and codes. Maintenance, testing, and inspection of fire protection systems, equipment, and design features are encompassed in the program.

Exemptions

Permanent exemption, EX-1, *Lack of Fire Dampers within Heating, Ventilating, and Air Conditioning (HVAC) Ductwork,* has been approved since 1991, and deals with the lack of fire dampers in nuclear facilities HVAC systems. Most HVAC systems lack fire dampers, which are required by various fire codes, due to the undesired interruption of airflow that can occur during fire conditions.

A permanent exemption, EX-059B, *Personnel Access Controls (PACs) – Buildings 762A, 792A, and 372A Automatic Suppression Requirements*, was submitted to DOE, RFFO on August 2, 2000. This exemption pertains to the DOE Order 420.1A, *Facility Safety*, requirements that facilities with a maximum possible fire loss in excess of $1 million have automatic fire suppression systems. The PACs have equipment inventories in excess of $1 million but do not have automatic fire suppression systems. Exemption EX-059A is currently approved and active. Exemption EX-059B will be modified and resubmitted as "C" to reflect the closing of Personnel Access Control System (PACS) 1 and 3.

A permanent exemption, EX-046, *Non-listed Deluge Valves and Gates Flow Control Valves*, was approved by DOE, HQ on January 8, 1999 and by DOE, RFFO on February 9, 1999. This exemption pertains to the use of non-Underwriters Laboratory (UL) or Factory Mutual approved equipment in fire systems contrary to NFPA Code requirements as indicated in DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees* [DOE, 1998]. The exemption documents an evaluation made that established an equivalency for the non-UL valves and their performance demonstrating reliability. These requirements apply to any facility with the identified types of valves. The exemption justification states that valve replacement would be costly and that the identified valves have performed successfully in past surveillances indicating a low risk of failure.

6.9.3 Programmatic Key Elements

The following key elements categorize the major topics of the Fire Protection Program that are relied upon in AB accident analyses. The topics within these key elements are summarized in the following subsections.

- Organization and Administration
- Fire Prevention
- Fire Detection and Suppression
- Configuration Management
- Fire/Emergency Response Capabilities
- Training and Qualifications

Organization and Administration

The K-H President accepts responsibility for the Sitewide Fire Protection Program and delegates its implementation and administration through the joint efforts of the Engineering Department within EES&QP and the Fire and Emergency Services Department within the Site Operations Department. These organizations interface with

Site Project and/or facility managers, who are responsible for ensuring the Fire Protection Program goals are satisfied in the respective Site Project and/or facilities.

Fire Protection Engineering

The FPE Manager, reporting to the SCE, functions as the Fire Protection Program Owner and oversees all FPE activities at the Site. He also acts as the Authority Having Jurisdiction for the Site Contractor on all fire protection matters. The manager of the Site contractor organization grants this authority in writing.

The FPE organization is responsible for enforcing code requirements, formulating and maintaining Site fire protection procedures and directives, performing design reviews providing technical support (e.g., surveys, code interpretation) to the existing facilities, and providing design support, review, and acceptance testing of new or modified fire protection systems and design features. During D&D activities for Site Closure, FPE reviews removal of fire detection and suppression equipment, and design features (i.e., fire walls). Removal of some equipment/design features may entail revalidation of area firewater sprinkler coverage.

The FPE organization performs FHAs for Category 2 and 3 Nuclear facilities, important non-nuclear structures, and new construction projects. These FHAs are comprehensive assessments evaluating the fire risk of individual areas in relation to existing or proposed fire protection. The FHA contains, but is not limited to, the elements delineated in FPE instructions. A current FHA exists for all nuclear facilities, and many other facilities at the Site. The FHAs are periodically updated in accordance with frequency set by FPE. The FHA conclusions are incorporated into applicable AB accident analyses and the *Site Emergency Plan* [RFETS, 1999b], or appropriately dispositioned.

Fire and Emergency Services Department

The Fire Chief, reporting to the Manager of Site Services, is delegated command authority of the Fire and Emergency Services Department and acts as Fire Marshal. These responsibilities include staffing and training of personnel to ensure a capable response to a fire, emergency medical or hazardous material incident at the Site. In addition, the Fire Chief is responsible for the procurement and maintenance of fire fighting and emergency medical equipment. The Fire Chief also has overall responsibility for formulating Fire and Emergency Services Department programs and monitoring the performance of the operating divisions. This includes activities involved in fire prevention, fire prevention training, fire suppression services, maintenance of fire fighting apparatus and equipment, and fire investigations.

Site Project and/or Facility Management

Site Project and/or facility managers ensure compliance with the provisions of the Fire Protection Program by employees and contractors under their jurisdiction. Facility managers must ensure the fire protection systems associated with their facility are maintained in accordance with the facility-specific AB operational controls and technical

requirements, and procedures or instructions promulgated through the Fire Protection Program. The Site Project and/or facility management duties include (a) scheduling operational testing and maintenance of fire detection and suppression equipment, (b) maintaining compliance to requirements, (c) tracking test data, and (d) initiating compensatory measures when fire alarm or suppression equipment are deficient or inoperable. Additionally, facility managers ensure fire protection system impairments and deficiencies are reported to appropriate maintenance and senior management in a timely manner, and that corrective actions are identified and assigned.

Inspection, Testing, and Maintenance

The maintenance program encompasses inspections, testing, and maintenance of fire protection systems, equipment, and apparatus, and the Fire Impairments Program. These activities are performed by a combination of Fire System Services; Alarms, Radio, Communications, Instrumentation, and Equipment (ARCIE); and facility maintenance personnel. Facility managers maintain activities within their control such that they are performed in accordance with established procedures, requirements, and safe work practices.

Fire Prevention

The Site also uses various methods to reduce fire initiation. These practices address education and control of activities and products with the potential to initiate a fire. Specific practices include (a) welding/hot work permits, (b) ignition source controls, (c) flammable gas controls, (d) specifications for handling and storage of flammable and combustible liquids, and (e) specific procedures for the transfer and storage of non-pyrophoric plutonium and pyrophoric metals. Furthermore, control of combustible loading is relied upon to prevent initiation and propagation of fires in areas where other initiators cannot be totally eliminated.

Periodic fire prevention inspections are utilized at the Site to minimize or eliminate potential and actual fire hazards. The Fire and Emergency Services Department has the primary responsibility for routine fire prevention inspections and for managing and coordinating them. However, Site employees are responsible for inspecting their work areas and correcting any existing fire hazards. Fire prevention is integrated into the Site infrastructure using the following methods.

- Procedures are implemented at the Site level delineating fire prevention expectations and responsibilities for both general and specific fire prevention activities.

- A permit system is utilized for all spark or flame producing activities and required adequate compensatory measures are identified prior to approval.

- Facility-specific AB documents incorporate controls developed, in part, from FHA conclusions while facility operating procedures and operation orders reiterate these requirements plus any special facility-specific circumstances.

- Regularly scheduled physical inspections by Fire and Emergency Services Department personnel are conducted for all facilities at the Site.

- Specific IWCP work package analyses (i.e., JHAs) implement fire controls as needed for identified hazards.

- Training and education that reinforce employee awareness of fire prevention issues.

Fire Detection and Suppression

The Site is equipped with a Sitewide alarm system for fire detection and security. An assortment of fire detection and alarm systems feed into the Sitewide alarm system to indicate the presence of a fire and the need for a suitable response. Such systems/methods may include ceiling heat detectors for rooms and buildings, heat detectors with associated alarms for filter plenum ducts, heat sensors with alarms for glove boxes and conveyors, use of smoke detectors, and flow alarms on sprinkler systems. Automatic detection systems are supplemented by manually-operated fire-phones and/or pull-boxes.

Manual and automatic fire alarm stations are located throughout most Site buildings and are connected to the Sitewide alarm system. Alarms generated by automatic/manual detection (e.g., glovebox overheat, smoke detection, pull stations, or fire-phones), or automatic/manual fire suppression systems (e.g., wet/dry sprinkler systems, deluge systems, Halon®) report through the Sitewide alarm system. Alarms are printed out, and annunciated visually and audibly at the Fire Dispatch Station. Upon receipt of an alarm, the Fire Dispatch Station initiates both Fire and Emergency Services Department and facility response.

Depending upon the magnitude and type of hazard, the property value of the area to be protected, and personnel safety concerns, various fire fighting equipment may be used. Areas containing hazards with the potential to impact the public are typically equipped with automatic fire suppression systems. Automatic suppression may be supplemented by manual fire fighting techniques utilizing pumper truck support and hose reel connections located throughout a facility, and fire extinguishers.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. The Fire Protection Program is focused on (a) combustible and flammable material controls, (b) fire protection features and equipment, and (c) fire services response. Combustible and flammable material controls are important in the accident modeling of postulated fire scenarios in AB analyses. The Fire Protection Program provides interpretation of the size and intensity of various combinations of typical combustible and flammable materials used at the Site. Therefore, FPE assesses the

introduction of new materials (e.g., fixatives used for contamination control and plastics used for confinement housing) into the Site activities and ensure analyses are unaffected.

The FPE organization is responsible for approving configuration changes for fire protection equipment and features. The current placement of fire walls, fire detection devices, and automatic sprinkler systems, as well as their design and performance specifications, are evaluated by FPE. Changes in hardware features are achieved by interfacing with the Engineering Program's configuration control process. Document changes are done in compliance with the *Site Document Requirements Manual* [RFETS, 2000].

Furthermore, FPE participates in the review and approval of work control activities that modify or impact fire detection, suppression and/or alarm systems. This approval is secured through the IWCP process.

Fire/Emergency Response Capabilities

The Fire and Emergency Service Department provides fire fighting and emergency medical services, as well as hazardous material spill or leak response. The Site is protected by a full-time professional fire department headquartered in Building 331. This central location allows for expeditious response to all areas of the Site. A complement of professional fire fighting personnel is available full-time to perform these tasks. A standard shift complement consists of one Battalion Chief, two Captains, and nine Firefighters. The personnel may be occupied with a variety of tasks, such as administration, dispatch, fire prevention, equipment testing, or training. All personnel may be dispatched when they are on duty. All fire department personnel are subject to recall.

Response equipment available for dispatch to an emergency scene includes fire pumpers, ambulances, a mini-pumper/rescue vehicle, a hazardous materials vehicle, and various utility vehicles. Each fire pumper is equipped with the requisite fire fighting equipment, as is the mini-pumper. The mini-pumper is also utilized for personnel rescues and hazardous material responses and is equipped with gear and equipment required to perform extractions and control hazardous materials spills and leaks.

Pre-fire plans and standard operating procedures and instructions are developed to address the use of water or other nuclear moderating materials to suppress a fire in nuclear moderation controlled areas. Restrictions on the use of water are justified based on criticality safety and are reviewed and concurred with by Criticality Safety Engineering.

Training and Qualifications

The *Fire Protection Program Plan* mandates that FPE staff positions be filled with appropriately educated and trained personnel. Qualifications for the various positions within FPE are established and approved by the FPE manager. The qualifications focus on education, experience and licensure.

The Fire and Emergency Services Department personnel are trained to carry out their functions as outlined in the *Fire Protection Program Plan* and implementing procedures. Emergency force personnel, which includes the positions of Firefighter I, Firefighter II, EMT, Paramedic, Fire Prevention Inspector, and Dispatcher, are trained in accordance with their respective NFPA standard. Training also meets the International Fire Service Training Association and Colorado Department of Public Safety (Division of Fire Safety) guidelines. Hazardous material responders are trained in accordance with the requirements of 29 CFR 1910 [CFR, 1994], Subpart H, *Hazardous Materials*. The Fire and Emergency Services Department performs the majority of the training and retains training records. Separate officers and staff is provided for this function.

New firefighters are required to attend and meet the criteria of the Site Fire Fighter Academy training program. The training program includes specialized training regarding fires in radiological and hazardous chemical environments. Special precautions for these situations are delineated in implementing procedures. Following successful completion of the academy program, each firefighter is required to be certified by the State of Colorado as an EMT, Firefighter, and Hazardous Materials Responder (technician).

Training for Fire System Services includes both On-the-Job Training (OJT), via an in-house program by the subcontractor (Integrated Safety Systems), and Colorado State certification through the Colorado Division of Fire Safety. The ARCIE personnel are trained via a Site OJT program.

To assure orderly and safe evacuation of Site personnel during a fire or related emergency, the Fire and Emergency Services and the Emergency Preparedness Departments coordinate efforts to perform periodic drills and provide assessments of drill effectiveness. These drills are both facility-specific and Sitewide. Sitewide drills may also involve State and local EROs.

6.9.4 References

CFR, 1994 — *Occupational Safety and Health Standards*, 29 CFR 1910, Code of Federal Regulations, Office of the Federal Register, July 1, 1994.

DOE, 1996 — *Facility Safety*, DOE Order 420.1A, U.S. Department of Energy, Washington, D.C., October 26, 1996.

DOE, 1998 — *Worker Protection Management for DOE Federal and Contractor Employees*, DOE Order 440.1A, U.S. Department of Energy, Washington, D.C., March 27, 1998.

RFETS, 1999a — *Fire Protection Program Plan*, 96-FP-PROG-0010, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, May 14, 1999.

RFETS, 1999b — *Site Emergency Plan*, EPLAN-99, Rocky Flats Environmental Technology Site, Golden, CO, December 15, 2000.

RFETS, 2000 *Site Document Requirement Manual*, MAN-001-SDRM, Rocky Flats Environmental Technology Site, Golden, CO, May 31, 2000.

RFETS, 2001 *Site Preliminary Hazards Analysis to Support Hazard Category 2 and 3 Nuclear Facilities' Authorization Basis Development*, NSTR-007-01, Engineering and Nuclear Licensing, Rocky Flats Environmental Technology Site, Golden, CO, April 2001.

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6.10 INTEGRATED WORK CONTROL

The IWCP establishes the planning requirements and process controls for work conducted at the Site, including emergency work. The IWCP ensures that work is planned consistently and hazards are appropriately analyzed and controlled. Integrated work control is an integral part of daily operations, construction, D&D, and maintenance within the Site facilities and is an effective tool for preventing accidents by ensuring that no unanalyzed or unauthorized work is performed.

6.10.1 General Program Description

The IWCP is the principal process for implementing work planning, management, execution and control processes using ISM at the Site. The Site's ISM philosophy is described in the *Integrated Safety Management System Manual* [RFETS, 2001a], which is the implementing document for DOE Policy 450.4, *Safety Management System Policy* [DOE, 1996]. The DOE policy subdivides the concept of ISM in six primary components: objective, principals, functions, implementation, responsibilities, and mechanisms. Through IWCP, the ISM System's five core functions and seven guiding principals are integrated throughout all levels of the Site.

The IWCP requirements are implemented using the *Integrated Work Control Program Manual* [RFETS, 2000a], which describes the requirements for initiating, documenting, and performing work, including emergency work. The IWCP integrates the other SMPs and Site programs into the work planning and execution process thus establishing the planning requirements and process controls for all work conducted at the Site. The IWCP ensures that all activities that present a hazard to the worker, public, or environment are planned and the plan contains the appropriate set of integrated safety and compliance controls.

In addition to the *Integrated Work Control Program Manual*, the *Site Conduct of Operations Manual* [RFETS, 2000b] provides additional guidance for performing work. The COOP provides an accurate, disciplined, and formal method for operating facilities and accomplishing the work planned through IWCP. The *Integrated Work Control Program Manual* uses a graded approach to identify controls that are appropriate for the work to be performed. Where appropriate, a facility's AB provides additional information concerning the IWCP as implemented within that facility.

6.10.2 Authorization Bases Importance

Activities that present a hazard to the worker, public, or environment are provided with a set of integrated controls through the IWCP process. The goal is the development of a comprehensive set of controls that prevent or mitigate hazards for each job. Some hazards at the Site have such potentially severe consequences that controls are formally analyzed, developed and implemented. These controls are documented as LCO and ACs

in operational controls associated AB documents as determined by Nuclear Safety. These LCOs and ACs are the most formal controls in use at the Site. Activities performed in facilities with AB controls are required to comply with those controls. Compliance to AB required controls, ensures that the work to be performed is done in such a manner that the safety envelope of the facility is maintained, thus protecting the worker, public, and environment. The IWCP process ensures that AB mandated controls are identified and implemented in all work performed on Site.

The important nuclear safety attributes of the IWCP focus on ensuring that all nuclear activities conducted at the Site are done in a formal and controlled manner that protects the worker, public, or environment. The attributes consist of various aspects of the key elements interrelated into processes that (a) ensure work is performed using approved work instructions and procedures, (b) ensure all work is planned and approved by appropriate approval authorities, and (c) maintain facility and Site AB requirements during work performance. The IWCP, Nuclear Safety, and Engineering control both design and work implementing documents. The IWCP provides the processes to document, plan, and perform the actual physical work. Nuclear Safety delineates the controls to ensure that nuclear activities are conducted safely, Site Engineering provides required engineering design input.

6.10.3 Programmatic Key Elements

The following key elements categorize the major topics of the IWCP that are relied upon in AB accident analyses. The topics within these key elements are summarized in the following subsections. Additional details are provided in the *Integrated Work Control Program Manual.*

- Organization and Administration
- Integrated Work Control Program Process
- Training and Qualifications
- Configuration Management

Organization and Administration

The K-H President accepts responsibility for the Sitewide IWCP and delegates its implementation and administration through EES&QP and its Engineering and Nuclear Safety and Licensing organization. The Program Owner is responsible for integration, programmatic oversight, and direction of the Sitewide IWCP. This responsibility includes interpreting and providing direction on Site standards and requirements for ISM as implemented through the IWCP process. Responsibilities also include ensuring that the Site Projects implement the standards and requirements, includes oversight and monitoring of the IWCP process through reviews, inspections, assessments and audits, and when required, direction to ensure safety is maintained.

Administration of the IWCP empowers Responsible Managers to provide formal, organized processes whereby trained personnel plan, perform, assess, and improve the safe conduct of work. The effectiveness of the IWCP is demonstrated via performance indicators. The IWCP is managed in such a manner that it (a) provides cohesive controls and guidance to manage work hazards and the risk associated with those hazards, (b) addresses State and Federal regulatory requirements, and (c) implements the five core functions and seven guiding principals of the ISM System.

Integrated Work Control Program Process

All essential elements of the IWCP require facility level implementation, which can be satisfied through implementation and compliance with the *Integrated Work Control Program Manual.* Activities that could present a potential hazard to the worker, public, or environment are provided with a set of integrated safety and compliance controls through the IWCP process. The five core functions of ISM, as implemented in IWCP, are (1) define the scope of work; (2) identify and analyze hazards; (3) identify and implement controls; (4) perform the work; and (5) provide feedback for improvement.

Scope of Work

Defining the scope of work utilizes discussions with the customer, stakeholders, and the Responsible Managers to identify the work. Determination of the appropriate approach to the planning process results from a thorough knowledge of the technical scope of the activity, a precise definition of the task(s) to be accomplished, and the establishment of firm boundaries on the activity. A more rigorous definition process is practiced for complex and/or highly hazardous activities than for routine or low hazard activities.

Activities that present a hazard to the worker, public, or environment are provided with a set of integrated safety and compliance controls using a graded approach to define the levels of environmental, safety, or health protection measures. Also, Site mission objectives are translated into work activities, performance expectations are set, and tasks are identified and prioritized sufficiently to allow for the identification of the associated hazards. The IWCP points to, and through, other interfacing SMPs such that it provides cohesive controls and guidance to manage work hazards and the risk associated with those hazards. As such, defining the scope of work for an activity is instrumental in developing activities and their controls so that the worker, public, and environment are protected through defense in depth.

Job Hazards Analysis

The second ISM related function of IWCP includes both the identification and analysis of hazards. Hazards are categorized so that appropriate safety and regulatory controls can be selected commensurate with the work to be performed. Analysis is performed to determine the consequences of the task and to provide a basis for the selection of the controls.

The process to perform this analysis is the JHA process. For purposes of performing an IWCP hazards assessment, the JHA is the only approved method. To analyze the hazards thoroughly and efficiently, a team-based approach utilizing a multi-disciplined team of individuals is employed. The JHA provides the vehicle to identify hazards associated with a specific activity, and link and document commensurate controls established through other programs to prevent or mitigate the impacts/hazards posed by the activity. The hazards evaluation and controls development is performed on a graded basis to the relative importance to safety, magnitude of the hazards, AB screening criteria, regulatory compliance requirements, facility specific characteristics, and environmental impact.

Controls

The third ISM related function of IWCP is to identify and implement controls. The IWCP process integrates all SMPs such that it provides cohesive controls and guidance to manage work hazards and their associated risk. The objective is to evaluate the potential impacts of identified hazards associated with the scope of work and apply the necessary controls in the implementing documents to safely perform the activity. The development and implementation of operational controls are customarily derived from the hazard analysis and related industry standards and requirements.

The JHA is the primary mechanism used to identify controls that specifically protect the workers. However, controls identified in other control documents (e.g., Radiological Work Permits (RWPs), NMSLs, ALARA reviews, or AB documents) are identified and integrated in the control sections of work control documents. A review and approval process ensures that the appropriate controls have been identified and incorporated into the work control document, as appropriate. These work control documents consist of work packages, work plans, and procedures.

Work Performance

The fourth ISM related function of IWCP is to perform the work safely. The safety of those performing work is ultimately in the hands of the workers themselves. However, the preparation and planning for the work must be performed in a manner that ensures the worker has the materials, training, equipment, supervision and technical support necessary to complete the assigned tasks successfully, safely, efficiently, and compliantly. The organization(s) performing the work shall comply with the requirements of the *Conduct of Operations* and *Integrated Work Control Manuals* for conduct of work and procedural compliance.

Feedback

Continuous improvement is provided through feedback, which is the fifth ISM related function. The effort to detect and study current and potential problems is an integral part of the IWCP process. Feedback includes evaluating data, such as radiation surveys, industrial hygiene monitoring, environmental monitoring, and self-assessment, that are collected through the other SMPs. There are several specific processes and

programs used to promote feedback and provide a means to improve the processes in existence at the Site. For example, these include COOP, toolbox meetings, Site communications methods, the Joint Company/Union Safety Committee, bargaining unit grievance process, Whistle-blower Order, personnel performance reviews, Site safety report, monthly/quarterly safety meetings, self-assessments, corrective actions, surveillances, in-process inspections, and Lessons Learned/Generic Implications Program.

Training and Qualifications

Responsible mangers are designated in writing by the Site Project Manager and are trained in the IWCP process. Planners must complete the Site IWCP Planner Qualification Document to be qualified as a Site planner. All personnel performing work must be qualified to perform the duties assigned to them. The work activity and assigned responsibilities govern the training and qualification of those that use the IWCP process. Required training is obtained through the Training Program as described in Section 6.16 of this chapter.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. The role played by the IWCP associated with configuration control at the Site is one of integrating appropriate and adequate reviews and approvals of work activities by affected programs. The IWCP process mandates that reviews are obtained prior to authorizing any work performance. For example, the Nuclear Safety Program requires that particular IWCP packages be screened using the USQ process against applicable AB documents. The requirements for a Nuclear Safety screen are determined during the development of the IWCP package, as are reviews for other safety disciplines such as Radiological Protection and Occupational Safety and Industrial Hygiene. Physical changes are planned using the Engineering and procurement programs. Work is performed, tested, and operational status is restored through the Conduct of Operations Program. Work package closure and documentation follow the changes to ensure the proper configuration is established and maintained.

Furthermore, the IWCP provides instructions for further configuration management processing via the *Site Engineering Process Procedure* [RFETS, 2001b]. As scope or conditions change, the package is re-evaluated and modified appropriately involving the appropriate safety personnel. Drawings, procedures, or other documents required to perform work are maintained in accordance with the applicable SMP.

6.10.4 References

DOE, 1996 *Safety Management System Policy*, DOE Policy 450.4, U.S. Department of Energy, Washington D.C., October 15, 1996.

RFETS, 2000a *Integrated Work Control Program Manual*, MAN-071-IWCP, Revision 3, Rocky Flats Environmental Technology Site, Golden, CO, October 30, 2000.

RFETS, 2000b *Site Conduct of Operations Manual*, MAN-066-COOP, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, October 30, 2000.

RFETS, 2000c *Quality Assurance Program Manual*, MAN-131-QAPM, Rocky Flats Environmental Technology Site, Golden, CO, November 15, 2000.

RFETS, 2001a *Integrated Safety Management System Manual*, 1-MAN-016-ISM, Revision 2, Rocky Flats Environmental Technology Site, Golden, CO, January 15, 2001.

RFETS, 2001b *Site Engineering Process Procedure*, 1-V51-COEM-DES-210, Rocky Flats Environmental Technology Site, Golden, CO, Revision 6, Change 03, March 28, 2001.

6.11 NUCLEAR SAFETY

The Site is a DOE-owned, contractor-operated nuclear complex and thus facilities are enveloped by the Nuclear Safety Program, which provides processes to evaluate the risk associated with performing activities involving or impacting nuclear materials. The purpose of the Nuclear Safety Program is to ensure all activities performed at the Site are evaluated and/or analyzed to identify mitigative and preventive measures and to determine their risk to workers, public, and environment. The Nuclear Safety Program also mandates the requirements for AB development, review, approval, revision, and implementation.

6.11.1 General Program Description

The Nuclear Safety Program implements the following DOE Orders: 5480.21, *Unreviewed Safety Questions* [DOE, 1991], 5480.22, *Technical Safety Requirements* [DOE, 1992a], 5480.23, *Nuclear Safety Analysis Reports* [DOE, 1994a] and 420.1A, *Facility Safety* [DOE, 1996]. In addition, the Nuclear Safety Program implements the technical direction documented in DOE, RFFO correspondence [RFFO, 2000]. The *Nuclear Safety Program Manual* [RFETS, 1997] defines how the requirements of these DOE orders are implemented at the Site, details organizational roles and responsibilities, and establishes the framework for implementing procedures. The *Nuclear Safety Program Manual* also describe the various aspects of the Nuclear Safety Program established to ensure (a) risks from and to facilities located on the Site are identified and reduced to acceptably low levels, (b) ABs for activities performed in these facilities or elsewhere on Site are adequately documented, (c) evaluations are performed for hazards associated with nuclear material operations and controls are identified, and (d) personnel and property are protected from the effects of potential accidents.

The Nuclear Safety Program provides safety evaluations, analyses, and reviews of facility activities that could potentially affect the health and safety of the workers and/or public or the protection of the environment. The program includes the USQ process for conducting safety evaluations of discovered conditions, proposed activities, facility modifications, operational tests, and experiments. Additional provisions include the documentation, review, and approval of activity and facility-specific accident analyses. Facility-specific accident analyses are performed using a graded approach based upon the facility hazard categorization. Nuclear Safety further supports safe operations by ensuring the appropriate approval authority and annual updating of AB documents. The Nuclear Safety Program is integrated with other SMPs to evaluate proposed activities that could affect the safety bases.

6.11.2 Authorization Bases Importance

The important nuclear safety attributes of the Nuclear Safety Program focus on providing a formal, documented system for the control of nuclear safety parameters and

their bases, identification, and verification. The attributes consists of various aspects of the key elements interrelated into processes to (a) ensure activities have an approved safety analysis or have been shown to be bounded by previously authorized activities before being performed, (b) review and verify work instructions, including changes and revisions, and validate operations procedures and testing instructions, and (c) review all safety SSC maintenance and modification work packages against the AB to determine if an USQ exists.

The identified hazards, assumptions, and controls in a nuclear safety analysis must be verified as changes occur in a facility to ensure that the safety analysis remains valid. Prior to performing an activity, all activity hazards must be identified and compared to other previously approved activities. In those cases where no similar activity is found, the new activity must have its own safety analysis. This process ensures that unknown hazards are not introduced into a facility. Appropriate control for any new hazards must also be identified in the safety analysis process.

Providing an established process for safety review of work instructions ensures that the performance of the activity does not introduce new hazards. Safety review of maintenance and modification work package ensures that the performance of maintenance or modification work does not introduce new hazards. This review process also ensures that appropriate controls for any identified hazards are required by the work package or the TSRs.

6.11.3 Programmatic Key Elements

The following key elements categorize the major topics of the Nuclear Safety Program that are relied upon in AB accident analyses. The topics within these key elements are summarized in the following subsections. Additional details are provided in the *Nuclear Safety Program Manual.*

- Organization and Administration
- Authorization Bases
- Operational Controls
- Independent Safety Review
- Configuration Management
- Training and Qualifications

Organization and Administration

Accident analyses performed to support AB documents for Site facilities assume that the Nuclear Safety Program is effectively organized and administered to ensure that the nuclear safety principles are integrated into all work performed at the Site. Therefore,

the K-H President is ultimately responsible for the Sitewide Nuclear Safety Program and delegates its implementation and administration through EES&QP to Engineering and Nuclear Safety and Licensing Department to the Site Projects nuclear safety departments.

The Nuclear Safety and Licensing organization is responsible for integration, programmatic oversight, and direction of the Sitewide Nuclear Safety Program. This responsibility includes interpreting and providing direction on Site standards and requirements for nuclear safety, as well as ensuring that the Site Projects implement those standards and requirements. This responsibility also includes oversight and monitoring of nuclear safety through reviews, inspections, assessments and audits, and when required, direction to ensure that nuclear safety is not compromised.

The nuclear safety management within each Site Project ensures (a) nuclear activities are performed in a safe manner, (b) nuclear safety AB documents are generated and approved in accordance with the *Nuclear Safety Program Manual*, and (c) accountability for nuclear safety. The Site Project-level nuclear safety management also supports facility management and operations organizations to ensure the safety of facilities and activities for which they are responsible. However, the responsibility for ensuring that Nuclear Safety Program requirements are implemented in the Site facilities is assigned and delegated directly to facility management, which has the following responsibilities:

- Ensures independent review of operations, activities, or changes that may impact the facility-specific ABs are performed per the requirements of the *Nuclear Safety Program Manual*;

- Ensures written procedures are prepared, approved, and implemented to conduct nuclear activities for normal and off-normal conditions, in compliance with the DOE approve nuclear safety AB for the facility;

- Ensures nuclear safety is the responsibility of each individual in the facility work areas;

- Directs recovery actions to approved recovery plans, when unacceptable nuclear safety conditions are determined to exist;

- Ensures facility, Sitewide, and DOE Complex-wide lessons learned affecting nuclear safety are factored into facility operations, and assesses lessons learned for impact on compliance with nuclear safety AB requirements; and

- Ensures facility activities are covered by the AB identified on the Authorization Basis Documents List (ABDL) maintained by the Nuclear Safety Program Owner.

Authorization Bases

A facility's AB may be comprised of various types of Site and/or facility-specific documents: (a) safety analysis documents including TSRs, (b) standing orders, (c) USQs, and (d) JCOs. Typically, the AB consists of one major, comprehensive safety analysis document, which presents the hazard classification for the facility, configuration of the facility, activities performed within the facility, accident analysis based upon these activities, and facility-specific operational controls. The AB may also include (a) DOE-issued safety evaluation reports and AB review reports, (b) authorization agreements, (c) DOE, RFFO correspondence specifying changes, updates, technical direction, or temporary exemptions to AB documents previously approved by DOE, RFFO, and (d) facility-specific commitments made to comply with DOE nuclear safety orders or policies for safe conduct of operations.

Safety Analysis Documents

The purpose of safety analysis documents is to provide a hazard assessment and safety analysis of facility and operational hazards and to develop a safety basis that demonstrates the safety of the facility's design and operation. Specifically, safety analysis documents provide a formal, documented system to give reasonable assurance that facilities can be maintained with limited risks to workers, the general public, and the environment from both nuclear and non-nuclear hazards. At the Site, safety analysis documents may be in the form of a SAR or BIO. The safety analysis documentation provides a description of the credited controls to prevent accidents or to mitigate the consequences of an accident that may result in a potential release of hazardous materials, both nuclear and non-nuclear.

The Safety Analysis process and the general responsibilities for the preparation of a safety analysis are provided in the *Nuclear Safety Program Manual.* Instructions regarding utilization of the information from DOE Orders 5480.23 and 420.1A are specified. Guidance from DOE-STD-1027-92 [DOE, 1992b], DOE-STD-3009-94 [DOE, 1994b], DOE-STD-3011-94 [DOE, 1994c], and DOE-EM-STD-5502-94 [DOE, 1994d] is also used for safety analysis documents. The level of analysis and documentation for a facility is based on a graded approach. Facilities that pose the greatest risk to workers and the general public require the highest level of analysis and documentation while the facilities that pose little or no risk require a much less rigorous evaluation.

Performance of safety analyses begins with the systematic identification of hazards, both nuclear and non-nuclear. These hazards are either qualitatively or quantitatively evaluated to identify potential accidents. Features are identified that have the potential to either mitigate releases or reduce the occurrence of accidents. Based on the results of the hazards evaluation, an appropriate level of accident analysis is performed. A spectrum of scenarios is identified to address a variety of accidents including operational accidents, natural phenomena, and accidents external to the facility. Evaluation guidelines are used to assess the severity of the calculated consequences. Exceeding these guidelines may require the implementation of hardware or ACs to

prevent or mitigate the consequences of identified hazards. These credited operational controls are formally documented and implemented in the facility.

Discovery Issues

A discovery issue results when a positive conclusion from Discovered Condition Screen is reached for a particular discovered condition. This is defined as a condition in which a discovery issue and, potentially a USQ, could exist based on discovery that the current AB is potentially inadequate (calling into question information explicitly or implicitly relied upon in the facility-specific accident analysis) or that the facility is potentially operating outside the assumptions in the AB. A facility off-normal occurrence report is issued upon the determination of a positive Discovered Condition Screen.

The AB discovery issues are typically identified via a variety of mechanisms including (a) compliance issues, (b) Occurrence Reports, (c) Readiness Reviews, (d) walkdowns, (e) Defense Nuclear Facilities Safety Board recommendations, (f) issues identified at other DOE sites, (g) DOE, RFFO technical direction, (h) NCRs, (i) AB development and review activities, (j) lessons learned, and (k) management assessments. When a new potential facility-specific Discovered Condition is identified, it will normally fall under one of the three following categories: new information, discrepant "as found" condition, or operational event. Also, a discovered condition can be considered historical (i.e., a discovery issue no longer relevant to current facility configuration). Immediate corrective actions are initiated and may become part of the AB.

Unreviewed Safety Questions

An established safety evaluation review process is used to evaluate changes to facilities, operations, tests, experiments, and compensatory actions or to disposition a discovery issue. The process provides for the review of proposed changes to a facility that could potentially exceed the established safety envelope in approved AB documents. These changes could be due to the following:

- a change in the inventory of hazardous material in the facility, both nuclear and non-nuclear (i.e., chemical);
- the installation of additional processes to the facility;
- a change in facility configuration;
- a change to the systems/utilities to the facility; and/or
- a significant change in existing process (such as, throughput or hazardous material handling procedures).

The USQ Process, which consists of Categorical Exclusions, Prescreens, Safety Evaluation Screens (SESs), and USQDs, is used to determine if an USQ exists, or

identifies required changes to DOE-approved AB documents as the result of the proposed change to the facility or operation. Categorical Exclusions are used to define a category or categories of activities or procedures that may be excluded from the USQ process. The justification for a categorical exclusion defines the conditions required for the exclusion to be valid. In some cases a USQD is used to justify the exclusion where a "NO" answer to all questions must result for all cases evaluated. A Prescreen can be used to evaluate the significance of the proposed change to determine whether a SES is required. A SES is prepared to determine whether a proposed activity involves a (a) change to the facility, (b) change to a procedure, (c) test or an experiment, or (d) existing condition for which a more detailed evaluation (i.e., USQD) is required. A USQD is prepared to determine if a USQ exists and if an AB document change is required.

Justification of Continued Operations

The purpose of the JCO process is to provide a means for a contractor to obtain DOE approval for operation of a facility on a temporary basis when the current TSRs cannot be fully met, or when necessitated by the facility condition, operational needs, or risk reduction activities. In effect, a JCO is a request for approval to operate temporarily outside the current nuclear safety AB. A JCO will provide the additional analysis or rationale necessary to justify the acceptability for continuing operating conditions when the facility cannot meet the AB, as approved. The analysis or rationale may include the use of compensatory measures taken to reduce risk for the duration of the affected operations.

DOE-approved JCOs are considered an integral and explicit part of the overall nuclear safety AB for the associated facility. The JCOs specify activities or operations that are allowed while AB non-compliant conditions exist, identify the consequence thresholds if different from the nuclear safety AB criteria, and specify required controls to minimize risk.

Operational Controls

Safety analyses identify the operational controls required to maintain acceptable risks from facility operations to facility personnel, collocated workers, the general public, and the environment. Operational controls generically apply to both nuclear and non-nuclear facilities. Historically, safety analyses have been prepared for nuclear facilities only, and operational controls were previously referred to as Operational Safety Requirements (OSRs) under DOE Order 5481.1B [DOE, 1987] and are currently referred to as TSRs under DOE Orders 5480.22 [DOE, 1992a] and 5480.23 [DOE, 1994a]. At the Site, depending upon when a safety analysis was documented, controls were established as OSRs or TSRs. Also, OSRs exist for non-nuclear facilities, such as the firing range, because separate and specific guidance for safety analyses and operational controls for non-nuclear facilities is not available within the DOE orders.

At the Site, the convention for safety analyses, which are currently being prepared or will be prepared in the future, is that TSRs apply to nuclear facilities only and the term

"operational controls" will be applied to radiological and non-nuclear facilities as defined by DOE-EM-STD-5502-94 [DOE, 1994d]. The specific term "Operational Safety Requirements" will not be used in the Site safety analysis and AB documentation in the future preparation of new AB documents. The term TSR is used here for convenience, but includes those OSRs that are still applicable. For radiological and non-nuclear facilities, operational controls will typically consist of only ACs as discussed below. For a non-nuclear, high- or moderate-hazard facility, engineered controls may be appropriate based upon the safety analysis.

For nuclear facilities, TSRs address, as appropriate based upon the safety analysis, the following types of controls: (a) Safety Limits, (b) LCOs, (c) SRs, (d) ACs, and (e) design features. Safety Limits are limits on process variables, such as temperature, pressure, and level, associated with physical barriers, generally passive such as tanks and buildings, that are necessary for the facility function and are found to be required to guard against uncontrolled releases of radioactivity and other hazardous materials. If a Safety Limit is exceeded, action will begin immediately to place the facility in the most stable and safe condition attainable. There are currently no Safety Limits identified at the Site.

The LCOs are the lowest functional capability or performance level of safety-related SSCs and their support systems required for normal safe operation of a facility. The LCOs are established for required engineered systems that protect the public and/or workers. The LCOs delineate SRs associated with the safety-related SSCs. The SRs relate to test, calibration, or inspection to ensure that the necessary operability of safety SSCs. The SRs are necessary to maintain operations within the TSR controls. When SRs are not successfully completed or accomplished within their required frequency, the systems or components involved will be assumed to be inoperative and actions defined by the LCOs will be taken until operability is shown.

The ACs ensure the credited programmatic controls are in place. The primary role of ACs is to capture the programmatic and personnel commitments important to safety. The ACs often represent one of three types of commitments: (a) assurance of valid assumptions, (b) provisions for worker safety or defense in depth, or (c) assurance of effective safety administration. Specific ACs may have SRs associated with them.

Design Features are those safety SSCs that are passive in nature and are specified in the TSRs that, if altered or modified, would have an impact on the safety operation of the facility. These SSCs are generally a design feature of the facility (e.g., building structure) or a specific component (e.g., waste container) that is credited in the safety analysis as a mitigative or preventive feature to reduce frequency or consequences.

Independent Safety Review

The Site uses an ISR process to enhance the safety of operations and activities. These include reviews of nuclear operations, programs, procedures, and activities that could directly or indirectly affect the safety envelope and/or the health and safety of the workers, public, and environment. The ISRs are conducted by multi-disciplined, technically competent individuals, which are matrixed from various organizations to

support the ISRC. Safety considerations are treated in the breadth and depth necessary to identify potential hazards and to evaluate the risks. The acceptability of the safety consequences and limitations or controls posed by such activities are evaluated and line management is advised accordingly.

The primary focus of ISR is to determine if a proposed activity or program could result in a nuclear safety issue as described below. The Site ISR is also responsible for an annual review of Site SMPs to ensure that they may continue to be credited in the appropriate ABs.

- An unplanned, uncontrolled, unmonitored, or unfiltered release of or exposure to radioactivity with the potential to significantly affect on-Site workers, the public, or the environment.

- A criticality violation (e.g., infraction, deficiency) of a CSOL or NMSL, violation of the double contingency principle, or an operation that is not sufficiently bounded by an approved implemented CSE.

- Degradation that could affect the operability or safety function of safety systems or equipment. This includes any activity that could affect the operability of these specified safety systems.

- An AB violation, potential USQ, or operation inconsistent with the defined safety envelope without prior DOE approval. The ISRC also considers whether DOE approval may be required due to the potential safety issues involved with the activity.

The composition of the ISRC includes one member (with at least one alternate) for each functional discipline. The members have sufficient technical breadth and depth to review the activity. The functional disciplines generally include Operations, Radiological Engineering, Engineering, QA, Nuclear Safety, OS&IH, and Independent Safety Review. The ISRC members must have an acceptable combination of education and experience related to the functional discipline they represent.

The ISR process generally consists of the following actions: (a) determination of whether an ISR is required, (b) preparation for and scheduling of ISR, (c) determination of the ISR methodology, (d) ISR review of items and identification of any safety issues, (e) disposition of ISR identified safety issues and other comments, if any, and (f) recommendation of approval or rejection. The process is formalized to ensure that an ISR is conducted to identify potential nuclear safety issues that could affect the safety envelope, safety equipment, worker safety, public safety, or the environment. Documentation is required to provide a written record of each ISR conducted at the Site.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within

specific SMPs. Configuration control of AB analyses and documents is the responsibility of the Nuclear Safety Program. The AB analyses rely upon the USQ process, which interfaces with the major Site processes ensures that changes to facilities, equipment, and activities to be performed at the Site are screened against the applicable AB documents. The hierarchy of specific screens provides varying levels of reviews based upon the proposed activity. The overall process ensures that all activities are within the current AB for all affected facilities.

The hierarchy of screens consists of Categorical Exclusions, Prescreens, SESs, USQDs, JCOs, and Discovery Issues. These documents are prepared, reviewed, and approved by qualified nuclear safety analysts and managers and managed through a central database administered within the Nuclear Safety and Licensing organization. Tracking numbers are electronically assigned and the completion indicated when the document is electronically scanned into the database.

The AB development and revision processes mandate that current operations are accurately represented in the AB documents. Annually, AB documents are reviewed, and updated if appropriate, to ascertain the accurate description and analysis of current operations. As indicated above, the USQ process is used to authorize activities for real-time operations. The USQs are incorporated into AB documents annually.

The ABDL is a controlled list of all current AB documents by facility. A facility-specific ABDL may consist of a major AB document, such as SAR or BIO, applicable USQs, and DOE, RFFO technical direction. Sitewide issues are added to each facility list, as appropriate. As new AB documents are developed and approved, the ABDL is modified.

Training and Qualifications

Nuclear safety training is provided for employees of organizations permanently assigned to the Site, contract workers, vendors, and visitors in accordance with Site procedures. Nuclear safety training is required for personnel specifically involved in nuclear activities and whose work potentially impacts nuclear safety at the Site. The focus of nuclear safety training is to provide workers and management with a fundamental understanding of the TSRs for maintaining credited nuclear safety functions and the nuclear safety bases and standard operation procedures related to complying with nuclear safety requirements. The type, depth, emphasis, and quantity of training is dependent on the employee's duties, responsible, and assignment. All nuclear safety training is developed and conducted in accordance with the Site training requirements.

A documented qualification program for nuclear safety engineers has been established and approved by the Engineering and Nuclear Safety and Licensing Manager. The elements of the qualification program include, as a minimum, the following:

- education in an appropriate technical discipline,
- relevant experience,

- nuclear safety OJT and experience,
- authoring or peer-reviewing nuclear safety analyses or evaluations,
- attending seminar, topical meetings, or university short courses in hazards assessment, safety analysis, risk assessment, etc.,
- participation in standards committees or nuclear safety work groups, and
- job performance that enhances the Sitewide Nuclear Safety Program.

6.11.4 References

DOE, 1987 — *Safety Analysis and Review System,* DOE Order 5481.1B, U.S. Department of Energy, Washington, D.C., May 19, 1987.

DOE, 1991 — *Unreviewed Safety Questions*, DOE Order 5480.21, U.S. Department of Energy, Washington, D.C., December 24, 1991.

DOE, 1992a — *Technical Safety Requirements*, DOE Order 5480.22, Change 1, U.S. Department of Energy, Washington, D.C., September 15, 1992.

DOE, 1992b — *Guidance on Preliminary Hazard Classification and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Safety Analysis Reports,* DOE-STD-1027-92, U.S. Department of Energy, Washington, D.C., December 1992.

DOE, 1994a — *Nuclear Safety Analysis Reports*, DOE Order 5480.23, Change 1, U.S. Department of Energy, Washington, D.C., March 10, 1994.

DOE, 1994b — *Preparation Guide for U. S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, DOE-STD-3009-94, U.S. Department of Energy, Washington, D.C., July 1994.

DOE, 1994c — *Guidance for Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans*, DOE-STD-3011-94, U.S. Department of Energy, Washington, D.C., November 1994.

DOE, 1994d — *Hazard Baseline Documentation,* DOE-EM-STD-5502-94, U.S. Department of Energy, Washington, D.C., August 1994.

DOE, 1996 — *Facility Safety*, DOE Order 420.1A, U.S. Department of Energy, Washington, D.C., October 26, 1996.

RFETS, 1997 — *Nuclear Safety Manual*, 1-MAN-018-NSM, Revision 0, Rocky Flats Environmental Technology Site, Golden, CO, September 30, 1997.

RFFO, 2000 B. A. Mazurowski, letter to R. G. Card, "Memo, Golan to Card, AME:ESD:MH:00-01176, dtd 1/27/00, subject: Rocky Flats Field Office Commitment to Nuclear Licensing Strategy for Closure," AME:NRD:MP:00-02784, DOE RFFO Memorandum, Rocky Flats Environmental Technology Site, Golden, CO, June 12, 2000.

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6.12 OCCUPATIONAL SAFETY AND INDUSTRIAL HYGIENE

The OS&IH Program is responsible for ensuring that applicable Federal health and safety practices are effectively implemented at the Site. The OS&IH Program ensures that hazard analyses and routine surveys are performed to anticipate, identify, evaluate, and control facility- or activity-specific health and safety hazards. The JHAs are conducted via the IWCP process. Health and safety hazards may be associated with facilities, processes, materials, equipment, tools, and operations. Types of hazards assessed include chemical, physical, biological, and ergonomic. Engineered or administrative controls may be implemented, as appropriate, to eliminate or control the identified or potential hazards.

6.12.1 General Program Description

The OS&IH Program contains provisions that implement Federal, State, and local regulations addressing physical, chemical, and biological hazards applicable at the Site. These standards are implemented via the *Occupational Safety and Industrial Hygiene Program Manual* [RFETS, 2000]. The OS&IH Program is implemented in concert with the IWCP requirements so that hazards are identified during early planning stages. Supervisors and workers are accountable for ensuring that the appropriate controls for OS&IH are implemented and integrated using the ISM philosophy.

Management commitment to the goals and objectives of the OS&IH Program is the fundamental value of the organization. Management commitment includes (a) establishment of programmatic controls for ensuring proper performance of evaluations, reviews, and appraisals of the OS&IH Program, (b) establishment of a process for exemptions, exceptions, and variances to DOE and OSHA health and safety requirements, and (c) pre-approval evaluation and review of internal and external organizations. Safe performance commitments are expressed through management policies and the resources provided for organizing and controlling activities at the Site.

The OS&IH Program encourages employee involvement so personnel at the Site have control over their own safety and health protection. Employee involvement is implemented by (a) management ensuring that workers are properly trained for the activities they perform, (b) workers participating in development of operations procedures, and (c) workers participating in safety meetings and safety inspections. Employee and supervisory responsibilities, as they pertain to the OS&IH Program, are outlined in Chapter 1 of the *Occupational Safety and Industrial Hygiene Program Manual.*

6.12.2 Authorization Bases Importance

The important nuclear safety attributes of the OS&IH Program focus on protecting the immediate worker from physical, biological, and chemical hazards. The

attributes consists of various aspects of the key elements interrelated into processes to ensure that health and safety personnel (a) identify and assess physical, biological, chemical, and ergonomic hazards, (b) establish appropriate controls using control hierarchy of engineered, administrative, and PPE, which is similar to the hierarchy used for AB controls as discussed in Section 6.1, for the identified hazards, and (c) involve workers in work planning, including the communication of identified radiological hazards and appropriate protective measures.

Worker involvement in work planning provides additional assurance that hazards associated with the planned activity are identified. This involvement also makes the worker aware of the hazards and corresponding protective measures, further ensuring that the protective measures will be implemented.

Exemption

A permanent exemption EX-057A, *Exemption to Code Compliance Requirement for Existing Vessels and Piping Systems at Rocky Flats Environmental Technology Site*, was submitted to DOE, RFFO on May 9, 2000. This exemption request addressed the DOE Order 440.1A requirement that all pressure vessels and support piping systems comply with American Society of Mechanical Engineers (ASME) B31 Piping Code and/or the strictest State and local codes. The exemption was determined to be unnecessary by the DOE. DOE Headquarter (EM-33) correspondence dated October 24, 2000 stated that it was "obvious that the ASME code was not applicable to Rocky Flats Environmental Technology Site (RFETS) considering that RFETS is near the end of its operating life, is scheduled for closure, and is to continue the maintenance program for pressure vessels until the RFETS closure mission is complete.

6.12.3 Programmatic Key Elements

The following key elements categorize the major topics of the OS&IH Program that are relied upon in AB accident analyses. The topics within these key elements are discussed in more detailed in the following subsections.

- Organization and Administration
- Hazard Communication Program
- Occupational Safety Requirements
- Industrial Hygiene Requirements
- Personal Protective Equipment
- Training and Qualifications
- Configuration Management

Organization and Administration

The OS&IH principles are integrated into all work performed at the Site. Therefore, the K-H President is ultimately responsible for the Sitewide OS&IH Program and delegates its administration through EES&QP to the OS&IH Department. The implementation of the OS&IH Program is the responsibility of line management. The OS&IH Department consists of SMEs, with expertise in the various safety disciplines addressed by the OS&IH Program, who are responsible for (a) assisting Site Project and facility management with application of the comprehensive Sitewide OS&IH Program, (b) analyzing technical issues and providing solutions to ensure safe and cost effective performance of work activities, and (c) hazard identification and abatement within the IWCP (see Section 6.10).

Each of the Site Projects has an OS&IH point of contact directly assigned to the Site Project to provide timely technical direction, issue interpretation, and general expertise with respect to OS&IH principles. These points of contact assist the Site Project and facility management to ensure activities comply with the OS&IH Program and workers are qualified to perform specific work activities. They also assess operations to ensure adequate implementation of the OS&IH Program and participate in the development of IWCP packages (see Section 6.10).

Hazard Communication Program

The OS&IH Program administers the Site's Hazard Communication Program. The purpose of the Hazard Communication Program is to define the requirements and responsibilities for information and training employees concerning workplace physical, chemical, and biological hazards. The 29 CFR 1910.1200, *Hazard Communication* [CFR, 1994a], 29 CFR 1926.59, *Hazard Communication* [CFR, 1994b], and DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees* [DOE, 1998] require employers to inform employees of the potential hazards existing in their workplace. This practice is meant to augment the Environmental Management Program (see Section 6.8) and Fire Protection Program (see Section 6.9) requirements in identifying the Site's requirements for working safely with chemicals during work processes such as cleaning, decontamination, demolition, maintenance and construction.

The Hazard Communication Program encompasses many methods of effectively communicating the hazards in the workplace. The program includes (a) controlling procurement of hazardous materials, (b) maintaining Material Safety Data Sheets (MSDSs) and hazardous material inventory files, (c) administrating the Integrated Chemical Management System, which tracks chemicals and inventories, and providing necessary reports for compliance and management, (d) providing guidelines for hazardous chemical labeling, (e) providing education and training, and (f) integrating hazard identification and abatement with the IWCP process (see Section 6.10).

Requests of procurement of hazardous chemicals are processed though the Chemical Dispensary and are reviewed based upon specified criteria. All chemical

purchases are tracked in the Integrated Chemical Management System. The MSDSs are required for all hazardous materials purchased and used at the Site; and are maintained in Work Area MSDS files. Prior to purchase, the MSDSs for new chemical are reviewed by OS&IH SMEs. The Site relies on labels that include (a) identity of chemicals (trade name), (b) name and address of manufacturer, importer, or other responsible party, and (c) appropriate hazard warning that includes signs and symptoms of exposure and target organ information. The NFPA system is used to convey this information.

Employees are provided with information and training relevant to the chemical hazards in their work areas. The information is provided upon initial assignment to a work area and prior to assignments involving new exposure situations, and includes allowable exposure limits, physical and health symptoms associated with exposure, and location of known reference material such as MSDSs. Employees are trained on methods of observations used to detect the presence or release of a hazardous chemical and protective measures such as specific task procedures, emergency procedures, and PPE.

Occupational Safety Requirements

Occupational safety requirements address worker interactions with physical hazards such as (a) high voltage electrical power, (b) high pressure and temperature systems, (c) flammable gases and liquids, (d) potential and kinetic energy sources, and (e) working at heights. Occupational safety also includes hazards that may have an adverse affect on workers such as high noise, extreme ambient temperatures, and inadequate illumination as well as miscellaneous hazards such as magnetic fields, lasers and non-ionizing radiation.

Within nuclear safety analyses, occupational safety hazards are examined to determine if they could initiate a release of hazardous material or increase the consequences of a hazardous material release. If an identified hazard cannot initiate, or increase the consequences of, a hazardous material release, the hazard can be dispositioned as a standard industrial hazard and detailed evaluation (i.e., accident analysis) is not required. Once a identified hazard is determined to be a standard industrial hazard, the AB process relies upon the OS&IH Program for guidance in providing appropriate and adequate controls.

These controls are either engineered or administrative controls, or a combination of both, and are implemented to eliminate or control the identified or potential hazard. Engineered controls (e.g., machine guards and local exhaust systems) are the preferred alternative. Administrative controls are used when the hazard cannot be eliminated or effective engineered controls are not available. Administrative controls include placing of barricades, posting of accident prevention signs, complying with lockout/tagout criteria, rotating workers, limiting exposure time, and using operational procedures. Personal protective equipment is used to protect the worker when the identified hazard cannot be fully eliminated or controlled by engineering or administrative methods.

Industrial Hygiene Requirements

Industrial hygiene requirements address worker exposure to chemical, physical, biological, and ergonomic hazards. These range from hazards found in most industrial environments, such as ambient temperature extremes, biohazards, confined spaces, and improper ergonomic equipment, to hazards found in more specialized environments like the Site, such as exposures to asbestos, lead, beryllium, and hazardous waste.

Industrial hygiene is focused on the health impacts to the human body, which are not generally considered accident initiators in their own right. Industrial hygiene engineered and administrative controls are important in AB accident analyses because they reduce the possibility of human error when workers are exposed to these hazards. These controls are identified using the IWCP process. Thus, AB accident analyses rely on the IWCP and OS&IH Programs to adequately address these impacts on human performance.

Occupational Exposure Assessment

The OS&IH Program has established the Occupational Exposure Assessment (OEA) Program, which is a systematic risk based process to ensure Site workers are not adversely affected from exposure to physical, chemical, and biological stressors in the workplace. Site industrial hygienists perform periodic sampling of operations to determine that exposures remain below the Occupational Exposure Limit, as defined in the *Occupational Safety and Industrial Hygiene Program Manual.* The OEA Program requires documentation of all exposure assessment records and air monitoring results exposure for historical purposes. Records are maintained by the OS&IH Program and Site Projects. The records assist the Site Project and facility management in work planning and task assignments.

A standardized methodology is used to perform OEAs throughout the Site. The OEA process is comprised of five basic components: (1) basic characterization, (2) qualitative risk assessment, (3) exposure monitoring strategy, (4) interpretation and decision making, and (5) recommendations and reporting. This standardized methodology is described in detail in Chapter 18 of the *Occupational Safety and Industrial Hygiene Program Manual.* The standardized methodology is used by all Site industrial hygienists in performing occupational exposure assessments and evaluating exposure. Thus, the standardized methodology ensures consistent Sitewide management of exposures.

Personal Protective Equipment

The AB accident analyses assume that workers are provided with appropriate PPE for their respective tasks. Typical examples of PPE include (a) head, eyes, hearing, face, and foot protection, (b) fall protection, (c) safe work apparel, (d) respiratory protection, and (e) emergency showers and eyewashes.

Respiratory Protection

Respiratory protection at the Site complies with 29 CFR 1910.134, *Respiratory Protection* [CFR, 1993], and ANSI Z88.2, *Practices of Respiratory Protection*, as mandated by DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards* [DOE, 1993]. Available respiratory protection equipment includes respirators with particulate or gas-filtering cartridges, supplied air respirators, self-contained breathing apparatus, and airline-supplied masks. The Respiratory Protection Program requires that personnel using respirators are issued respirators only upon verification of medical approval, training, and fit testing. Training and fit testing is performed annually. Records of respiratory protection training, fitness and medical testing, and maintenance are maintained.

Training and Qualifications

As indicated above, the OS&IH Department consists of SMEs with expertise in the various safety disciplines addressed by the OS&IH Program. These SMEs have special training in their respective subject and are expected to stay current with changing regulations, codes, and standards.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. The OS&IH Program reviews proposed changes to ensure the hazards are properly controlled. This includes ensuring that implemented controls are not defeated by proposed modifications. For example, the OS&IH reviews ensure that electrical power, high pressure systems, and flammable gases are controlled within Federal regulations, industrial standards and codes, and OS&IH Program procedures. The OS&IH Program establishes requirements for procurement and use of monitoring equipment, personal protective equipment, and administrative controls through the use of other sitewide programs including procurement, IWCP, and Engineering.

6.12.4 References

CFR, 1993 — *Respiratory Protection*, 29 CFR 1910.134, Code of Federal Regulations, Office of Federal Register, June 1993.

CFR, 1994a — *Occupational Safety and Health Standards*, 29 CFR 1910, Code of Federal Regulations, Office of Federal Register, July 1, 1994.

CFR, 1994b — *Safety and Health Regulations for Construction*, 29 CFR 1926, Code of Federal Regulations, Office of Federal Register, July 1, 1994.

DOE,1993 — *Environmental Protection, Safety, and Health Protection Standards*, DOE Order 5480.4, Change 4, U.S. Department of Energy, Washington, D.C., January 7, 1993.

DOE, 1998 *Worker Protection Management for DOE Federal and Contractor Employees*, DOE Order 440.1A, U. S. Department of Energy, Washington, D.C., March 27, 1998.

NEC, 1999 *National Electric Code*, NEC-1999, 8th Edition, National Fire Protection Association, Quincy, MA, January 1, 1999.

RFETS, 1997 *Inspection of Tanks or Piping Systems, Pressure Vessels and Safety/Relief Devices*, Rocky Flats Standard, SM-137, July 10, 1997.

RFETS, 1998 *Site Fuel Gas Systems Hazards Analysis*, CALC-RFP-98.0555-RGC, Revision 0, Rocky Flats Environmental Technology Site, Golden, CO, May 1998.

RFETS, 2000 *Occupational Safety and Industrial Hygiene Program Manual*, MAN-072-OS&IH PM, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, November 30, 2000.

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6.13 QUALITY ASSURANCE

The DOE-approved QA Program provides a framework for the effective planning, development, execution, and documentation of work at the Site to meet regulatory, DOE, and other external requirements. The QA Program organizes essential Site infrastructure and programs into a coherent approach for the implementation of quality requirements into all Site activities. The DOE regulations and directives for quality assurance are used as the baseline for developing the QA Program; and waste repositories and other external organizations may impose additional quality requirements for selected activities. Execution of the QA Program ensures that the potential for radiological and other harms to the worker, public, and environment is minimized and controlled and that work is effectively and efficiently performed and documented in compliance with requirements.

6.13.1 General Program Description

The Site is a DOE-owned, contractor-operated complex that contains non-reactor nuclear facilities as defined in 10 CFR 830, *Nuclear Safety Management* [CFR, 1995a]. Those Site facilities and activities with potential for radiological harm are required to be operated in accordance with the requirements of 10 CFR 830.120, *Quality Assurance Requirements* [CFR, 1995b]. The remaining facilities and activities are subject to DOE Order 414.1A, *Quality Assurance* [DOE, 1999]. The requirements of both are structurally and methodologically similar, therefore the Site QA Program ensures consistent and appropriate application of these and other quality requirements mandated by external obligations for the performance of activities using a graded approach as described in the *Site Quality Assurance Manual* [RFETS, 2000c]. A list of other quality assurance requirements and directives addressed by the program are found in the reference section under the heading *Additional Pertinent Documents*.

The graded approach ensures that the level of analysis, documentation, verification and other controls are sufficient to provide (a) assurance of safety, (b) due consideration of hazards, (c) consideration of the facility's life-cycle stage, (d) alignment with the programmatic mission and particular characteristics of the facility, including regulatory compliance requirements, (e) consistency with AB and design/safety basis documentation, and (f) effective performance of activities. The *Site Quality Assurance Manual* also provides addition guiding principles to be use in the application of the graded approach. The graded approach provides the flexibility to implement the Site programs in a way that best suits the facility or activity, while maintaining full compliance with 10 CFR 830.120 and DOE Order 414.1A.

Furthermore, the QA Program criteria provide the standards to balance performance-based and prescriptive processes, complete the Closure Contract commitments, and meet customer requirements and expectations. These criteria include fundamental processes for the management, performance, and assessment of work to achieve the Site mission in cost-effective, regulatorily compliant, and customer-satisfying ways.

Quality assurance is a shared interdisciplinary function. It involves management and individual contributors of all organizations responsible for producing items, performing activities, providing services, and independently verifying that items, activities, and services comply with specified standards and requirements. Each individual is responsible for the (a) quality of their work, (b) identifying non-conforming items, and (c) complying with requirements and procedures. Individuals who are responsible for producing an item or performing an activity and their immediate management have direct and final responsibility for the quality of the item, activity, or service. They are responsible for reviewing item reliability, process implementation, and other quality-related information and analyzing data to identify items and processes needing improvement.

6.13.2 Authorization Bases Importance

The important nuclear safety attributes of the QA Program focus on providing a conceptual and programmatic framework for the management, performance, and assessment of facilities and activities with the potential for radiological harm. The attributes consist of key elements that create a structure for the programmatic requirements necessary for the safe and effective conduct of activities with impacts on nuclear safety.

By definition, the ten criteria from 10 CFR 830.120 listed in Section 6.13.3 are important to nuclear safety, although all may not be considered in the safety analysis. The Site programs and procedures that implement these criteria encompass the controls and activities necessary to ensure repeatable, sufficient, and documentable results from work activities involving the potential for radiological harm. The proper execution of the Site QA Program provides the structure and methodology needed to appropriately control work and manage risk.

At a facility level, the more noteworthy quality assurance criteria are quality improvement, work processes, and management assessments. These criteria require specific attention as a part of facility specific management systems; the other criteria (e.g. training and qualification, procurement, design) are implemented via more general Site infrastructure programs, and described in other SMPs. The quality improvement management system (which includes the Site corrective action process) ensures that problems are identified, graded by importance, tracked, corrected and evaluated for trends so that recurrence is avoided and performance may be improved. Work processes are the backbone of an operating facility; this quality assurance criterion integrates a spectrum of work and item control processes. Work control is discussed in Section 6.10, *Integrated Work Control*. Management assessment is a tool for continued improvement and overall system status determination.

6.13.3 Programmatic Key Elements

The following key elements categorize the major topics of the QA Program that are relied upon in AB accident analyses. The topics within these key elements are

summarized in the following subsections. Additional details are provided in the *Site Quality Assurance Manual* [RFETS, 2000c].

- Organization and Administration
- Quality Assurance Program Required Elements
- Training and Qualifications
- Configuration Management

Organization and Administration

The K-H President is responsible for overall policy and management direction that drives the QA Program. The K-H Quality Program organization maintains the Site QA Program and policy. Administration of the QA Program is accomplished through EES&QP to the Independent Oversight and Quality Assurance organization. This organization is responsible for applying the appropriate graded approach to the integration, programmatic oversight, and direction of the Sitewide QA Program. This responsibility also includes oversight and monitoring of quality assurance through reviews, inspections, assessments and audits, and when required, direction to ensure that quality assurance is not compromised.

Project Managers, Facility Managers and Program Owners are responsible to implement the specific portions of the QA Program that apply to their work and responsibilities adhering to the Site-level direction and performing self and management assessments. Generally Site Project implementation of QA takes the form of developing and executing their activities and programs in accordance with the Site infrastructure. The Site Projects provide data to the QA Program Owner for trend analysis. Individual employees and line management are responsible for the achievement of quality.

Quality Assurance Program Required Elements

The 10 CFR 830.120 and DOE Order 414.1A are structurally and methodologically similar, therefore the QA Program implements their respective requirements similarly in the *Site Quality Assurance Manual* [RFETS, 2000c]. By definition, the ten criteria from 10 CFR 830.120 are important to Nuclear Safety. The Site programs and procedures that implement these criteria encompass the controls and activities necessary to ensure repeatable, sufficient, and documentable results from activities involving the potential for radiological harm. The execution of the QA Program provides the structure and methodology needed to appropriately control work and manage risk.

Program

Implementation of the Program criterion requires that Project Managers, Facility and other Responsible Managers execute their responsibilities from Section 5 of the *Site Quality Assurance Manual.* In particular, organizations should have clear roles, responsibilities, and authorities delineated for quality-affecting activities; managers should plan, allocate resources, and assess work in well-defined ways.

Personnel Training and Qualification

The scope of the QA Program encompasses training activities programmatically contained and executed in the *Training Program Manual* [RFETS, 2000b]; there are additionally specific requirements for the training and qualification of persons performing assessments and audits (refer to Independent Assessment discussion). The Training Program provides the assurance that personnel are trained for managing, developing, performing, and assessing work activities. Continuing training is provided to ensure job proficiency is maintained. The training process is designed to enable management to determine and document job-specific and general training requirements for their employees. Training methods include formal training conducted by qualified instructors, briefings conducted by management-approved personnel, required readings, workshops, seminars, and awareness training. Implementation requirements and responsibilities for personnel training and qualification shall be documented. Refer to Section 6.16 for additional information concerning the Training Program.

Quality Improvement

The Site's commitment to quality improvement ensures that problems are identified, graded by importance, tracked, corrected, and evaluated for trends so that recurrence is avoided and performance improved. Infrastructure programs have been established and implemented to detect, prevent, and correct quality-related problems.

The Corrective Action Program is implemented via the *Site Corrective Action Reporting Manual* [RFETS, 2001] and includes various identification and reporting processes, each developed and implemented in order to satisfy specific laws, requirements, or regulations. Although these processes contain many Corrective Action Program elements, they individually do not satisfy all of the umbrella requirements and laws, such as 10 CFR 830.120 and DOE Order 414.1A. As a result the Site deficiency identification and reporting processes are required to follow the *Site Corrective Action Requirements Manual.* The *Site Corrective Action Requirements Manual* and its implementing procedures ensure uniform prioritization, tracking and trending of deficiencies and compliance with minimum corrective action elements. The PATS is the approved Site tracking system; other authorized equivalent systems are delineated in the *Site Corrective Action Requirements Manual.*

Those items and activities that do not meet established criteria and/or predetermined quality requirements are identified, documented, analyzed, dispositioned, corrected, and selectively verified in accordance with the Site corrective action process.

Non-conforming items are controlled to prevent inadvertent installation, testing, or use. Based upon the importance to safety and the significance of the identified problem, causal factors are evaluated to establish the cause.

Documents and Records

The *Site Documents Requirements Manual* [RFETS, 2000a] provides the methodology and requirements for controlling and developing Site documents. These documents include policies, management directives, manuals, procedures, instructions, and job aids. The *Site Documents Requirements Manual* identifies the type, purpose, applicability, and approval requirements for the Site document types. Refer to Section 6.5 for additional information about the Document Management Program.

The Document Management Program is designed such that Site documents that prescribe processes, specify requirements, or establish design are prepared, reviewed, approved, issued, and controlled for use by personnel managing or performing work. Controlled documents are distributed to the user in a manner that ensures the use of the latest revision; ensure that obsolete and superseded documents are stamped, destroyed, or recalled to prevent their inadvertent use; ensure routine verification of controlled status, and the documents are maintained by indices.

The Document Management Program has been established to ensure that Site records providing evidence of quality are specified, prepared, reviewed, approved, authenticated, legible, transferred, collected, maintained, stored, retained to identified retention periods, and indexed for accountability and retrievability. Line Managers normally identify the scope of records to be retained within the procedure that generates the record. The Records, Documents and Administrative Services organization provides assistance to Site organizations in the determination of records and appropriate retention schedules.

Work Processes

Work processes and activities, including special processes, are performed in accordance with Site program documents and implementing procedures. Controls for work processes affecting quality are identified through the IWCP. The documents which implement the controls to do the work are defined through the *Site Document Requirement Manual*, IWCP and COOP processes, which result in the establishment of instructions, procedures, drawings, training requirements, and other approved means. Proceduralized infrastructure programs and process control systems have been established and continue to evolve to assure standardized and consistent achievement of requirements, goals, and objectives.

Individual employees and line management are responsible for the achievement of quality. Line managers ensure that activities affecting quality are controlled by approved procedures or other appropriate means. The IWCP is the primary reference for work control at the Site.

The extent of the quality assurance controls is commensurate with the scope, complexity, and risk associated with the activity. Controls for work processes affecting quality assurance are identified through the IWCP process. Corrective, preventative and predictive maintenance will be accomplished for specific equipment based upon a graded approach. Not all items will be maintained to prevent damage and deterioration due to the closure mission of the Site. Equipment used for data collection, monitoring safety systems/functions is calibrated and maintained. The Measuring and Test Equipment (M&TE) Program provides control to calibrate and maintain calibrated equipment. The Metrology organization provides administrative and technical expertise for Site calibration organizations. The organizations using M&TE and their supporting organizations are responsible for providing technical input on usage, environment, and other factors that affect the acquisition, use, and calibration requirements for M&TE to Metrology.

Quality assurance is also important in corrective, preventive, and predictive testing and maintenance activities as discussed in Section 6.15, *Testing, Surveillance, and Maintenance*. Quality assurance mandates that equipment used for monitoring or data collection is calibrated and maintained. Inspections, testing, and calibration to verify compliance of an item to specified requirements and/or demonstrate satisfactory performance for service will be planned, documented, performed, and evaluated using a graded approach according to risk.

Design

The design element provides controls for design of items and processes using engineering/scientific principles and appropriate standards. Design work includes the integration of the Engineering Program, AB requirements, and nuclear material safety considerations. Quality assurance ensures design work includes (a) incorporation of applicable requirements and design bases, (b) identification and control of design interfaces, and (c) verification and validation of the adequacy of design products by individuals or groups other than those who performed the work. The verification and validation is completed before approval and implementation of the design.

Design control applies to items, facilities, and processes and is documented and implemented through procedures, design packages, and work packages. Computer hardware and software elements are treated as a unit for the purpose of configuration control. The basic design process is described in Section 6.7, Engineering, and is controlled within the Engineering organization. Software management is controlled in accordance with the *Computer Software Management Manual* [RFETS, 1997].

Procurement

Procurement of the appropriate items and/or services is a Site function, but relies heavily on initial facility and engineering input to determine the necessary importance and reliability required for the procured item or service. The Site procurement process provides a planned and controlled approach to procurement activities to ensure procured items and services comply with specified requirements. Procurement documents contain

the technical, quality, and acceptance requirements for the procurement of items and services. For example, due to the importance of safety SSCs in protecting the public and workers, the procurement of quality items and services related to safety SSCs must ensure high reliability/availability of safety SSCs. Considerable judgement is required in selecting appropriate controls for a specific purchase

Inspection and Acceptance Testing

Site infrastructure programs provide for inspection, testing, and calibration of specified items, services, and processes to demonstrate that items and processes perform as intended. The Testing, Surveillance, and Maintenance (see Section 6.15) and Integrated Work Control (see Section 6.10) Programs provide controls for the activities that require inspection, testing, and calibration. Inspection, testing, and calibration are conducted using established acceptance and performance criteria. Equipment used for inspections and tests is calibrated and maintained. Inspections, testing, and calibration to verify compliance of an item to specified requirements and/or demonstrate satisfactory performance for service will be planned, documented, performed, and evaluated using a graded approach according to risk.

Controls are established and provide for documented methods to communicate the status of operations, equipment, and systems to affected personnel. The work package planning process specifies lockout and tag-out situations and utilizes methods to convey the status of pre-operational and post-maintenance activities to promote the safe operation of equipment and systems. A formal return to service process following successful post-maintenance testing is established.

The Metrology Program includes process, inline instruments as well as the standard M&TE. Controls are provided so that inspection and acceptance testing, identified in the technical documents, are performed and documented as required and in accordance with procedures. The subsection on Work Processes above details M&TE programmatic requirements more fully.

Management Assessment

Management assessment is a process whereby managers periodically evaluate their programs, activities, functions, and processes to determine adherence to applicable requirements, management expectations, and implementation of best management practices. Management assessments place emphasis on the use of human and material resources to achieve Site goals and objectives.

Management assessments are documented evaluations at the process, system, or program level that focus on how well a manager's area of responsibility is performing. Management assessments identify problems that hinder the organization from achieving its objectives. Effective management assessments provide objective evidence of management evaluation of those areas in which improved performance is required to achieve the organizational mission and management goals. Management assessments focus on those areas presenting the greatest risk for failure, or where significant need for

improvement has been demonstrated. Self-evaluations or self-assessments are one form of management assessment. Other forms of management assessment include, but are not limited to, critiques, reviews, walkdowns, and appraisals.

Management assessment expectations for organizations and facilities are set forth in the *Site Integrated Oversight Manual* [RFETS, 2000d]. The development and execution of an organizational plan that meets the program's requirements is the primary method of compliance with this requirement.

Independent Assessment

Independent assessments are used to evaluate the performance of work processes with regard to requirements, expectations of the customer, and progress toward achieving the Site mission and goals [RFETS, 2000d]. Independent assessment activities are conducted to assure the appropriate quality assurance requirements are incorporated into Site work control processes and documents, and are included in Site daily activities. Independent assessment activities evaluate floor level compliance with Site infrastructure programs and procedures. Independent assessment activities are documented and reports are provided to appropriate levels of management. Findings are used to evaluate effectiveness of the processes and identify needed improvements. Independent assessment concerns are tracked and follow-up actions taken to verify that corrective action is accomplished as scheduled.

Personnel performing independent assessments must be technically qualified and knowledgeable of the areas being assessed. Independent assessment activities are controlled programmatically by the *Site Integrated Oversight Manual* [RFETS, 2000d], which ties to the scheduling, qualification, and execution procedures.

Training and Qualifications

Personnel performing independent assessments must be technically qualified and knowledgeable of the areas being assessed. The specific requirements for assessor training are set out in the *Site Integrated Oversight Manual*, which ties to the Site qualification procedure for assessors.

The lead auditor certification at the Site is based upon education, certification, experience, communication skills, Site-specific training, and participation in Site audits/assessments. Lead auditors are expected to pass an examination that evaluated their comprehension of and ability to, apply the knowledge of codes, standards, regulations, and procedures. The examination may be oral, written, practical, or any combination of these three. The examination is a one-time requirement; however, lead auditors are expected to maintain proficiency through regular and active participation in the audit/assessment process; review and study of codes, standards, procedures, instructions, and other documents related to the QA Program or program auditing; and participation in training programs.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs.

Quality assurance principles are used in the verification and validation processes for Site documents as well as records management. Also, quality assurance inspections are used within procurement to ensure that equipment and parts meet the correct criteria for which they were purchased and with work control to verify work was completed and tested as required.

6.13.4 References

Referenced in Text

CFR, 1995a — *Nuclear Safety Management*, 10 CFR 830, Code of Federal Regulations, Office of Federal Register, January 1995.

CFR, 1995b — *Quality Assurance Requirements*, 10 CFR 830.120, Code of Federal Regulations, Office of the Federal Register, January 1995.

DOE, 1999 — *Quality Assurance*, DOE Order 414.1A, U.S. Department of Energy, Washington, D.C., September 29, 1999.

RFTES, 1997 — *Computer Software Management Manual*, 1-MAN-004-CSMM, Revision 0, Rocky Flats Environmental Technology Site, Golden, CO, February 6, 1997.

RFETS, 2000a — *Site Document Requirements Manual*, MAN-001-SDRM, Rocky Flats Environmental Technology Site, Golden, CO, May 31, 2000.

RFETS, 2000b — *Training Program Manual*, MAN-094-TMP, Rocky Flats Environmental Technology Site, Golden, CO, September 18, 2000.

RFETS, 2000c — *Quality Assurance Program Manual*, MAN-131-QAPM, Rocky Flats Environmental Technology Site, Golden, CO, November 15, 2000.

RFETS, 2000d — *Site Integrated Oversight Manual*, 1-MAN-013-SIOM, Revision 2, Rocky Flats Environmental Technology Site, Golden, CO, December 30, 2000.

RFETS, 2001 — *Site Corrective Action Program Manual*, MAN-012-SCARM, Revision 3, Rocky Flats Environmental Technology Site, Golden, CO, January 31, 2001.

Additional Pertinent Documents

Packaging and Transportation of Radioactive Material; Subpart H, Quality Assurance, 10 CFR 71, Code of Federal Regulations, Office of Federal Register.

Procedural Rules for DOE Nuclear Activities, 10 CFR 820, Code of Federal Regulations, Office of Federal Register.

Definitions, 10 CFR 830.3, Code of Federal Regulations, Office of Federal Register.

Criteria for the Certification and Re-Certification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 Disposal Regulations, 40 CFR 194, Code of Federal Regulations, Office of Federal Register.

Records Disposition, DOE Order 1324.2, U.S. Department of Energy, Washington, D.C., (referenced within DOE Guide 830.120).

Implementation Guide for Use with 10 CFR Part 830.120, Quality Assurance Requirements, DOE Guide 830.120, Revision 0, U.S. Department of Energy, Washington, D.C.

Worker Protection Management for DOE Federal and Contractor Employees, DOE Order 440.1, U.S. Department of Energy, Washington, D.C., March 27, 1998.

Personnel Selection, Qualification and Training Requirements for DOE Nuclear Facilities, DOE Order 5480.20A, U.S. Department of Energy, Washington, D.C., November 15, 1994.

WIPP Hazardous Waste Permit: US EPA No. NM 4890139088.

U.S. Department of Energy Carlsbad Area Office (CAO), Quality Assurance Program Document, CAO-94-1012, Revision 3.

Standards and Calibration Program, DOE/AL 57XA.

Nevada Test Site Waste Acceptance Criteria, DOE/NV-325.

Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs, ANSI/ASQC E4-1994.

Calibration Laboratories and Measuring and Test Equipment - General Requirements, ANSI/NCSL Z540-1-1994.

Sampling Procedures and Tables for Inspection by Attributes, ANSI/ASQC Z1.4-1993.

Quality Assurance Requirements for Nuclear Facility Applications, ASME NQA-1-1989.

Quality Assurance Requirements for Nuclear Facility Applications, ASME NQA-1-1994.

Standard Guide for Establishing a Quality Assurance Program for Analytical Chemistry Laboratories Within the Nuclear Industry, ASTM-C-1009-89.

American Society of Nondestructive Testing (ASNT) Recommended Practice, and Supplements, SNT-TC-1A.

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6.14 RADIOLOGICAL PROTECTION

The goal of the Radiological Protection Program is to establish and maintain adequate radiological protection, as it applies to Site activities (e.g. design, construction, operations, maintenance, and D&D activities), and to comply with all applicable requirements. The Radiological Protection Program provides a balanced approach for achieving pre-designated radiological safety goals for the Site facilities and workers. This basic principle provides sufficient radiological protection commensurate with the nature of the activities performed by applying the ALARA process to occupational exposure. Furthermore, the Site endeavors to ensure radiation exposures to workers and the public, and releases of radioactivity to the environment, are maintained below regulatory limits.

6.14.1 General Program Description

The Radiological Protection Program policy is to provide radiological protection that meets the requirements of 10 CFR 835, *Occupational Radiation Protection* [CFR, 2000] and good practices of DOE-STD-1098-99, *Radiological Control* [DOE, 1999]. The Radiological Protection Program also fulfills the requirements of DOE Orders 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees* [DOE, 1998], and 420.1A, *Facility Safety* [DOE, 1996], and other radiological protection-related regulatory codes and standards. The *Site Radiological Control Manual* [RFETS, 2000b] defines the requirements, organization, qualifications, and training applicable to the Site. The requirements of 10 CFR 835 are implemented at all levels of the Site through the *Site Radiation Protection Program* [RFETS, 1999b], *Site Radiological Control Manual* [RFETS, 2000b], *Site Radiological Safety Practices* [RFETS, 2000a], technical basis documents, Site policies, and DOE Guides. This includes the requirement of 10 CFR 835.102 for internal audits of the radiation protection program. The *Site Radiation Protection Program* and *Site Radiological Control Manual* are periodically reviewed to ensure they are current with 10 CFR 835, DOE Orders, and national codes and standards.

The Radiological Protection Program implements standards, limits, and program requirements for protecting personnel and property from exposure to radiation and radioactive materials during the conduct of work activities. The Radiological Protection Program interfaces with each Site Project and/or facility to protect personnel from radioactive materials through surveillance, contamination control, and minimization of personnel exposure to penetrating radiation. The program provides for personnel dosimetry, the surveillance and maintenance of engineered radiation protection systems, a RWP process, and area surveillance and posting. Radiological protection for planned activities is ensured through reviews of work control documents, pre-job surveys, and the specification of PPE. Personnel exposures are formally tracked, recorded, and reported back to individuals. Exposure histories undergo periodic review.

In addition to human performance measures, radiological control performance is achieved through engineered design features. Design objectives include (a) minimization of the dose rate to workers, (b) minimization of discharges of radioactive liquids and airborne effluents to the environment, (c) efficiency of maintenance, decontamination and operations, (d) minimization of contamination and buildup in equipment, (e) provision of support facilities for donning and removal of protective clothing and for personnel monitoring, (f) control of airborne radioactive material, (g) determination of and calculations to support surface contaminated object status for release of radioactive waste to areas outside of site boundaries, and (h) proper selection of construction materials.

6.14.2 Authorization Bases Importance

The important nuclear safety attributes of the Radiological Protection Program focus on protecting the immediate worker from radiation exposure. The attributes consist of various aspects of the key elements interrelated into processes to (a) identify and assess radiological hazards, (b) establish appropriate controls for the identified radiological hazards, and (c) involve workers in work planning, including the communication of identified radiological hazards and appropriate protective measures.

A process to identify and assess radiological hazards encountered in a facility provides the knowledge needed to develop an appropriate set of controls for work activities. Information gathered provides the knowledge base for control development. For example, radiation area monitoring, contamination monitoring, and dosimetry all provide data important to determining PPE, task timing, and shielding. Posting and labeling as well as sealed radioactive source accountability and control help prevent exposure to unexpected hazards.

As a defense-in-depth measure, worker involvement in work planning provides additional assurance that radiological hazards associated with the planned activity are identified. This involvement also makes the worker aware of the hazards and corresponding protective measures, further ensuring that the protective measures will be implemented.

6.14.3 Programmatic Key Elements

The following key elements categorize the major areas of the Radiological Protection Program as they relate to AB accident analyses. The topics within these key elements are discussed in more detail in the following subsections. Specific details are found in the *Site Radiological Control Manual.*

- Organization and Administration
- ALARA Program
- Dosimetry Program
- Area Monitoring and Control Program

- Radiological Work Controls Program
- Radiological Safety Training Program
- Recordkeeping
- Configuration Management

Organization and Administration

The K-H President is ultimately responsible for the Sitewide Radiological Protection Program and delegates its implementation and administration through EES&QP to the Central Radiological Safety organization, which is managed by the Site Radiation Protection Manager. This organization consists of Radiological Engineering, Radiological Safety Training, Radiological Health, and Regulatory Compliance/Performance Assessment groups. The Central Radiological Safety organization is responsible for radiological protection activities at the Site, such as:

- formulating and maintaining the Site radiological protection procedures and directives;
- ensuring personnel responsible for performing radiological work activities at the Site are appropriately trained;
- concurring with Site generated radiological control training materials;
- implementing the ALARA process; and
- providing technical support to the Site Projects and facilities.

The Central Radiological Safety organization functions to administer the requirements of 10 CFR 835 through the *Site Radiological Control Manual*, *Site Radiological Safety Practices*, and other supporting documents (e.g., technical basis documents, facility-specific procedures, department-specific procedures, and management directives). Integration of the Radiological Safety Program at the facility level is accomplished through the *Site Radiological Control Manual*, *Site Radiological Safety Practices*, facility-specific procedures and facility ABs, as applicable. Integration of radiological work controls at the facility level is accomplished through the IWCP process, and on occasion, by Site standing orders.

Each Site Project and/or facility has a Radiological Safety Manager, who reports to the EES&QP Manager as well as an equivalent reporting relationship to the Radiation Protection Manager. Reporting to the Radiological Safety Managers are the Radiological Building Engineers, Radiological Control Technician Technical Supervisors (RCTTSs) and Radiological Control Technicians (RCTs). The RCTs and RCTTSs have the responsibility of assisting and guiding workers in the radiological aspects of the job. The RCTs and RCTTSs also have the responsibility and authority (as do all supervisors, line

supervision, and any worker through their supervisor) to stop work or mitigate the effect of an activity if they suspect that the initiation or continued performance of a job, evolution, or test will result in the violation of a radiological control or result in imminent danger or unacceptable risk.

ALARA Program

The ALARA process is integrated throughout the Site and uses administrative controls, employee training, engineering design, proper work practices and procedures, and emergency response measures to achieve the desired results. The primary responsibility for keeping personnel exposures ALARA rests with each individual worker; however, the following methods are used to achieve ALARA objectives.

- Establishing employee and organizational level ALARA goals, tracking employee exposure, and maintaining associated records;
- Allocating the appropriate technical, administrative, and supervisory resources that are necessary;
- Restricting access to radiation and radioactive contamination areas;
- Using equipment, such as mockups and videotapes, to minimize the working time required in high radiation areas and high surface contamination areas, as appropriate; and
- Using engineered controls (e.g., ventilation, remote handling, and shielding) and monitoring equipment (e.g., continuous air monitors and remote area monitors).

The *Site Radiation Protection Program* establishes formal plans and measures for applying the ALARA process to occupational exposure. The *Site Radiological Control Manual* implements the ALARA program, while the *Site ALARA Program Manual* [RFETS, 1999a] provides guidance for this implementation. Specific procedures related to ALARA principles are contained in the *Site Radiological Safety Practices*.

The Site ALARA Oversight Committee (AOC), as directed by the *Site Radiation Protection Program* and *Site Radiological Control Manual*, is established to evaluate the ALARA program and initiate actions to improve the program. The committee consists of a diverse mix of technical and administrative personnel who make recommendations to management to improve progress toward minimizing radiation exposure and radiological releases. The guidelines, membership, and rules of the AOC are specified in the AOC Charter, a K-H directive.

The Site has an annual Administrative Control Level (ACL) for the general radiological worker for the whole body of 500 mrem Total Effective Dose Equivalent (TEDE). A specific ACL may be established for a specific work group based upon an evaluation of the historical and projected radiation exposures, work load and mission of

the group. Specific ACLs are reviewed and concurred with by the AOC and approved by the Senior Site Executive.

The historical average measurable radiation dose for workers on Site is 0.2 rem (TEDE) per year. The individual with the highest dose does not exceed the DOE ACL of 2.0 rem. This compares to the maximum allowable DOE limit of 5 rem (TEDE) per year. The annual ALARA goals, recommended by the AOC and approved by the Senior Site Executive, estimate the following year's dose for each Site project. These estimates and measured doses are compared each quarter by the AOC.

Dosimetry Program

The internal and external dosimetry programs effectively evaluate, document, report and track internal and/or external individual doses received. The data are used to effectively monitor work area radiological conditions that could result in internal and/or external individual doses. All external dosimeters are coded with a permanent identification number. Prior to being placed into service, these are entered into the computer database which is used to track, control, and monitor each dosimeter's history. This database provides a means of identifying dosimeters, which have not been returned at the end of the specified wear period.

Internal and external dosimetry results are reviewed prior to becoming official. External dosimetry results are electronically transferred to the Radiological Records database. After peer review, the internal dosimetry results are hand entered into the same Radiological Records database. The database automatically combines the internal and external doses.

External Dosimetry

External dosimetry provides indication of the radiation exposures received by personnel, areas, and the environment. External dosimetry devices are capable of indicating both penetrating and non-penetrating radiation exposures that contribute to a person's occupational exposure. External dosimetry for areas and the environment provides an indication of the general radiation field in Site areas.

External dosimetry devices used for monitoring occupational whole body and extremity exposure are accredited by the DOE Laboratory Accreditation Program for the appropriate radiation types and categories. The types of external dosimetry devices used at the Site include the following:

- **Whole Body**: Whole body dosimetry is provided to all visitors and radiological workers with the potential to receive 100 mrem in one year from external sources. Dosimeters may be required for entry into any Radiological Buffer Area or as specified by RWP (or other work control document). The RFETS whole body dosimeter includes a Personnel Nuclear Accident Dosimeter (PNAD) pack. Whole body dosimeters are routinely exchanged on a quarterly or semi-annual basis. Other exchange periods may be used as

requested by radiological safety personnel or as exposure conditions warrant. Additional dosimeters may be requested and issued to workers either to monitor exposure for a specific job (supplemental dosimeters) or to monitor non-uniform exposures (Multi-badges).

- **Extremity:** Extremity dosimetry is assigned to individuals involved in tasks where the dose to the extremities is significantly greater than the whole body dose.

- **Environmental:** Environmental dosimeters are located in various outdoor areas around the Site to monitor the external exposure conditions in those areas.

- **Area:** Routine whole body dosimeters are mounted in fixed locations to check the stability of radiation conditions in the workplace. The numbers and locations are specified by facility radiological safety personnel.

- **Accident**: Fixed Nuclear Accident Dosimeters (FNADs) are placed in buildings with criticality alarms. Together with PNADs, FNADs provide a passive means of measuring the dose from criticality accidents.

Internal Dosimetry

Personnel who have the potential to receive an intake resulting in a dose of 100 mrem in a year are placed into a routine bioassay program. Selection for the program is based on their current radiological worker training and respirator fit status. An evaluation of the need to participate is made at the time an external dosimeter is requested. Depending on work history and other factors, a baseline bioassay sample may be requested at that time.

All workers in the Routine Bioassay Program are given periodic lung counts. Counts are done as frequently as workload and equipment availability permits. The goal of the program is to obtain a count from each active participant at least every 18 to 24 months. Additionally, all workers in the Routine Bioassay Program are also asked to submit periodic urine samples. The goal of the program is to obtain a urine sample for each active participant every 12 months.

Facility radiological safety personnel may specify, in the RWP (or other work control document), bioassays for specific jobs. Internal Dosimetry provides input as to the type of bioassay and its frequency. Workplace indicators (contamination, confirmed air monitor alarms, etc.) are used to trigger follow-up (special) bioassay measurements. Special bioassay may consist of urine sampling, fecal sampling, and lung or wound counting. In addition, facility radiological safety personnel, based on judgement and experience and in the absence of any workplace indicators, may request bioassay follow-up sampling. Also, any individual may make a personal request for sampling.

Area Monitoring and Control Program

The Area Monitoring and Control Program is in place to monitor, control, document, track, and evaluate area radiation, contamination, and airborne radioactivity levels. Radiological monitoring of radiation exposure levels, contamination, and airborne radioactivity is conducted to (a) characterize workplace conditions, (b) verify the effectiveness of physical design features and engineering and administrative controls, and (c) identify areas that require postings. Also, monitoring of individuals and areas (a) documents radiological conditions of the workplace, (b) detects changes in radiological conditions and buildup of radioactive material in the workplace, and (c) routinely identifies specific and general area sources of personnel exposure to radiation.

Radiological instrumentation is selected, operated, maintained, and calibrated to implement an effective Area Monitoring and Control Program. The instrumentation includes fixed, potable, or laboratory instruments. The range and sensitivity of the instruments are appropriate for the intended purpose. Typical fixed instruments include continuous air monitors, selective alpha air monitors, and personnel contamination monitors. A wide variety of portable instruments are available to perform localized dose rate, airborne radioactivity, and surface contamination monitoring. Laboratory instruments, such as alpha-beta counters, are used to determine the level of contamination on swipes and air filters. Other laboratory instruments support the Routine Bioassay Program.

Radiological instruments are used only to measure the radiation for which their calibrations are valid. Calibration procedures exist for each radiological instrument type, and include frequency of calibration and requirements for (a) pre-calibration, (b) primary calibration, (c) periodic performance testing, (d) calibration recordkeeping, and (e) maintenance. These instruments are calibrated in accordance with standards of ANSI N323A, Radiation Protection Instrumentation Test and Calibration, Portable Survey Instrumentation. In summary, instrumentation used for monitoring are periodically maintained and calibrated for the appropriate types, levels, and energies of the radiations encountered, and routinely tested for operability. Calibration facilities exist to perform inspections, calibrations, performance tests, calibration equipment selection, and quality assurance.

Radiological Work Controls Program

The RWP is an administrative mechanism used to establish radiological controls for intended work activities. The RWP informs workers of radiological conditions and entry requirements, and provides a mechanism to relate worker exposure to specific work activities. An RWP contains pertinent information for performing the intended work safely and within ALARA guidelines. The information includes, but is not limited to, a description of the work, radiological conditions of the work area, dosimetry requirements, stay time controls, and special dose or contamination reduction considerations. The supervisor responsible for the work area and the appropriate radiological control supervisor approve the RWPs. Radiological surveys are reviewed to evaluate the

adequacy of the RWP requirements. Workers acknowledge that they have read, understand, and will comply with the RWP before their initial entry to the area and after any revisions to the RWP.

Integration of radiological work controls (i.e., RWPs) at the facility level is accomplished through the IWCP process. Radiological work is required to be planned, scheduled, authorized, and conducted in a manner that clearly identifies radiological hazards and integrates associated design features, engineered controls (including shielding), administrative controls, and PPE (including respirators) into appropriate work processes to ensure that:

- Radiological area entry and exit controls are established;
- Radiological areas (radiation, high radiation, very high radiation, airborne radioactivity, high contamination, radiological buffer, and radioactive material areas) and radioactive materials are posted and labeled;
- Equipment and materials from radiological areas are surveyed and evaluated for unrestricted release; and
- Sealed radioactive sources are identified, accounted for, and leak tested.

The Respiratory Protection Program is administered through the OS&IH Program. Refer to Section 6.12 for additional information.

Radiological Safety Training Program

The *Site Radiation Protection Program* mandates that all Radiological Protection Program staff be qualified and trained. Qualifications are established and approved by the Radiological Protection Program Owner. When applicable, qualification standards shall meet, as a minimum, the requirements of 10 CFR 835.103, Subpart J. Radiological Protection personnel are trained to carry out their functions as outlined in the *Site Radiological Control Manual, Site Radiation Protection Program*, and implementation documents.

Recordkeeping

Radiological records are maintained in compliance with the requirements of 10 CFR 835 and Site procedures. Document control measures ensure that records and reports are reviewed for adequacy and approved for release by authorized personnel. Records are used to document radiological safety afforded to on-Site personnel. Records are handled, used, and stored in a way that preserves the quality of the information, with proper retrievability, indexing, and data protection procedures. Records are retained until final disposition is authorized by DOE.

The Radiological Records Management Program ensures that auditable records and reports are controlled through the stages of creation, distribution, use, arrangement, storage, retrieval, media conversion, and disposition. This program applies to records

and reports such as (a) radiological policy statements, (b) radiological control procedures, (c) individual radiation doses, (d) dosimetry policies and procedures, (e) personnel radiological training, (f) ALARA records, (g) instrumentation test, repair, and calibration records, (h) radiological surveys, (i) area monitoring dosimetry results, (j) RWPs, (k) radiological performance indicators and assessments, (l) radiological improvement reports, (m) radiological incident, occurrence, and critique reports, (n) accountability records for sealed radioactive sources, and (o) records of unrestricted release of material.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. The Radiological Protection Program maintains the configuration of radiological equipment, personal protective equipment, and administrative controls such as radiological procedures. The Radiological Protection Program reviews proposed changes to ensure the hazards are properly controlled. This includes ensuring that implemented controls are not defeated by proposed modifications. The Radiological Protection Program establishes requirements for procurement and use of monitoring equipment, personal protective equipment, and administrative controls through the use of other sitewide programs including procurement, IWCP, and Engineering.

6.14.4 References

CFR, 2000 — *Occupational Radiation Protection*, 10 CFR 835, Code of Federal Regulations, Office of the Federal Register, January 1, 2000.

DOE, 1996 — *Facility Safety*, DOE Order 420.1A, U.S. Department of Energy, Washington, D.C., October 26, 1996.

DOE, 1998 — *Worker Protection Management for DOE Federal and Contractor Employees*, DOE Order 440.1A, U.S. Department of Energy, Washington, D.C., May 28, 1998.

DOE, 1999 — *Radiological Control*, DOE-STD-1098-99, U.S. Department of Energy, Washington, D.C., July 1999.

RFETS, 1999a — *Site ALARA Program Manual*, MAN-064-SAPM, Revision 0, Rocky Flats Environmental Technology Site, Golden, CO, January 1, 1999.

RFETS, 1999b — *Site Radiation Protection Program*, RPP-0001, Revision 3, Rocky Flats Environmental Technology Site, Golden, CO, November 5, 1999.

RFETS, 2000a — *Site Radiological Safety Practices*, Rocky Flats Environmental Technology Site, Golden, CO, September 19, 2000.

RFETS, 2000b *Site Radiological Control Manual*, MAN-102-SRCM, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, October 15, 2000.

6.15 TESTING, SURVEILLANCE, AND MAINTENANCE

The purpose of the Testing, Surveillance, and Maintenance (TSM) Program is to ensure that safety SSCs continue to perform their intended functions by conducting (a) periodic surveillances and/or testing of equipment performance, (b) predictive and/or preventative maintenance on a predetermined schedule, and (c) corrective maintenance upon discovery of conditions that render safety SSCs inoperable. The TSM Program applies to both nuclear and non-nuclear facilities based upon the appropriate DOE order utilizing a graded approach. In performing the intended functions, the SMP utilizes established programs at the Site including but not limited to health and safety, maintenance and testing equipment, engineering standards for non-conformance and retesting, procurement, quality assurance receiving inspection and acceptance, training, and COOP.

6.15.1 General Program Description

The TSM Program, administered via the *Site Maintenance Management Program Manual* [RFETS, 2000b], implements requirements from DOE Orders 5480.19, *Conduct of Operations for DOE Facilities* [DOE, 1992], 4330.4B, *Maintenance Management Program* [DOE, 1994], and 430.1A, *Life Cycle Asset Management Program* [DOE, 1998]. The intent of these DOE orders is to ensure facilities are operated and maintained in a safe, compliant condition. The TSM accomplishes this within the context of RFETS's closure mission. The Site authorization basis documents designate those critical systems that must be maintained to meet the authorization basis Technical Safety Requirements and regulatory requirements. Since RFETS is a closure site, process systems critical to closure activities are tested, surveilled and maintained, while other systems are allowed to "run to failure."

The TSM Program addresses all facility safety SSCs requiring periodic testing, surveillance, and maintenance. This program is implemented on the Site Project or facility level depending upon the equipment. Facility management is responsible to ensure all aspects of this program are appropriately implemented for the equipment within the affected facility. The TSM Program provides assurance that safety SSCs continue to perform their intended functions. Maintenance of safety SSCs relies on the development and use of work packages and procedures that have been properly documented, reviewed, and approved. Work is performed using the *Integrated Work Control Program Manual* [RFETS, 2000b] that controls the entire process from identification of the need for testing or maintenance to returning the SSC to service. The *Integrated Work Control Program Manual* interfaces with the other Safety Management Programs and their implementing procedures. The *Integrated Work Control Manual* also provides the tools to implements ISM and provides detailed guidance on how the core functions of ISM are implemented at the Site.

6.15.2 Authorization Bases Importance

The important nuclear safety attributes of the TSM Program focus on ensuring that equipment as defined in the facility-specific AB documents are available to perform their intended functions when required. The attributes of the TSM Program consist of various aspects of the key elements interrelated into processes to (a) perform safety and technical reviews and approvals of maintenance work packages involving equipment defined in facility-specific AB documents, (b) control changes and revisions to maintenance work packages, (c) perform inspection, surveillance, and/or acceptance testing of SSCs following maintenance, (d) establish preventive maintenance requirements for SSCs, and (e) performing periodic surveillances and testing of identified equipment.

Exemptions

A permanent exemption EX-067, *Maintenance Craft Qualification Program*, was approved by DOE, RFFO on March 29, 2000. This exemption pertains to establishing a program to train and qualify maintenance personnel as required in DOE Order 4330.4B, *Maintenance Management Program* [DOE, 1994]. The exemption justification states several reasons for the request that relate to the current mission of the Site and time frame to establish and administer the program as well as the cost. In addition, credit is given to relying on licensed craft journeymen, the IWCP, and job-specific training.

As part of the DOE and K-H Contract (DE-AC34-00RF01904), DOE, RFFO has included formal correspondence [DOE, 2000] in which DOE recognizes the unique nature of RFETS as a closure site. It provides that a formal Condition Assessment Survey Program for Site facilities, where a specific group of trained inspectors examine facility structural elements and equipment in a specified percentage of the Site buildings/structures each year, will not be required. The RFFO agrees that these facility condition evaluations will be accomplished through the Critical Safety System Elements Surveillance, Preventive Maintenance, and annual Fire Inspection Programs.

6.15.3 Programmatic Key Elements

The following key elements categorize the major areas of the TSM Program as they relate to AB accident analyses. The key elements summarize the requirements from DOE Order 4330.4B and provide the framework for the TSM Program at the Site. The topics within these key elements are discussed in more detail in the following subsections. Specific details of the TSM Program are found in the *Site Maintenance Management Program Manual* [RFETS, 2000a].

- Organization and Administration
- Testing
- Surveillance
- Performance of Maintenance Activities

- Materials and Supplies
- Training and Qualifications
- Configuration Management

Organization and Administration

The organization and administration of the Site maintenance function ensures that a high level of performance in maintenance is achieved through effective implementation and control of maintenance activities. This implementation is often required to support the validity of initial conditions and inherent assumptions used in the AB accident analyses. Therefore, the K-H President is ultimately responsible for the Sitewide TSM Program and delegates its implementation and administration through the TSM Program Owner. The Site Projects' organizations define the lines of authority and responsibilities for the Site Project and facility managers, supervisors, and other appropriate personnel and are responsible for implementation and compliance with the TSM Program.

To assure requirements are implemented consistently and appropriately throughout the Site Projects, each project has a TSM Program point of contact who interfaces with the TSM Program Owner. For the TSM Program to remain viable, points of contact with the background and training to adequately execute program requirements are assigned to the TSM Program, with clearly defined lines of responsibility within each facility. These points of contact ensure that an appropriate blend of preventive, predictive, and corrective maintenance is maintained utilizing a graded approach in implementing program requirements depending upon the position of the facility within the facility life cycle.

The Site Project-specific TSM Program points of contact are responsible for coordination and scheduling of surveillances and planned maintenance in such a manner as to minimize the impact on facility operations. They also ensure that sufficient resources, equipment, and tools are available to perform expected maintenance activities in the most expeditious and efficient manner. The *Site Conduct of Operations Manual* [RFETS, 2000c] requires authorization for TSM activities be obtained prior to performing the activities. The TSM activities are conducted utilizing either IWCP work packages or procedures, each of which have had the requisite reviews and approvals. Facility management and/or Site Project-specific TSM Program points of contact walk the areas with specific attention to facility condition and housekeeping and ensure the SSCs surveillance, preventive maintenance, and fire inspection programs are conducted as scheduled. Additionally, facility management and/or Site Project-specific TSM Program points of contact ensure that the Freeze Protection Program is adhered to in the facilities under their control. Unplanned occurrences related to maintenance are reported and investigated using the Site process for Occurrence Reporting.

A Site Steering Group/Integration Team, Maintenance Management Council, has been formed to provide consistency in operations and to review, coordinate, and resolve Site programmatic issues involving maintenance operations. The Maintenance

Management Council meets periodically and is comprised of the Site-level TSM Program Owner, Maintenance Manages or points of contact for each of the Site Projects, and the IWCP Owner.

Testing

Periodic testing is completed to verify operability of safety SSCs and ensure other systems/components important to safety are capable of performing their designed function. Post Work Testing is required to return equipment to service after maintenance or repair. Post Work Testing must satisfy the return to service requirements identified in the *Conduct of Operations Manual* [RFETS, 2000c]. Testing may also include calibrations of equipment as required.

Surveillance

Periodic surveillances are performed for equipment identified in AB documents in accordance with COOP, Nuclear Safety, and Criticality Safety Programs and other necessary requirements. Surveillances are completed in accordance with approved procedures based on the frequency and acceptance criteria outlined in the facility-specific AB documents. In addition to those SSCs that are credited specifically in the AB, support systems and equipment included in other safety management programs are subject to surveillance through contractor procedures.

Performance of Maintenance Activities

Maintenance facilities, equipment, and tools efficiently support facility maintenance and maintenance training. The TSM Program requires that a proper balance of corrective and preventive maintenance be employed to provide a high degree of confidence that (a) facility equipment degradation is identified and corrected, (b) equipment life is adequate for the remaining life of the facility, and (c) the maintenance program is cost-effective. Corrective maintenance is prioritized and conducted in accordance with the IWCP. Preventive maintenance is also governed by IWCP and the equipment is identified in accordance with approved preventive maintenance programs, which comply with the Site's [RFETS, 1999] or Site Project's Preventive Maintenance Program plans.

Property inventory lists include all equipment on Site and serve as the "Master Equipment List," as necessary for maintenance through Site closure. For preventive maintenance, each Site Projects' maintenance organization has a master list of equipment developed in accordance with the Site procedures, such that the equipment receives routine preventive maintenance.

Maintenance work is conducted in accordance with the *Integrated Work Control Manual* [RFETS, 2000b] and *Site Conduct of Operations Manual* [RFETS, 2000c]. The IWCP provides an effective system for prioritizing and planning work. The Site Projects plan and prioritize maintenance activities using the *Integrated Work Control Program Manual* and facility-specific prioritizing processes. A planning team walks down the job and works together to develop work instructions that will result in efficient and safe

conduct of the work, including ALARA considerations. As a minimum, the planning team consists of a planner and workers who are knowledgeable about the work, but may include other SMEs. Maintenance activities are scheduled using the "Plan of the Day" or "Plan of the Week." Post-work Testing is performed to verify that equipment can fulfill their design function when returned to service after maintenance. Design modifications are primarily governed by the Configuration Management and Engineering Programs (see Sections 6.3 and 6.7, respectively).

Due to facility closures in the near future, the Site does not maintain a formal maintenance history and trending program. The Site Project and/or facility maintenance organizations maintain a work archiving system and preventive maintenance records to assist in tracking recurring maintenance problems for equipment and systems.

Materials and Supplies

The TSM Program requires parts, materials, and services for maintenance activities be available when needed. At the Site, the IWCP provides the vehicle to specify the needed parts, materials, and services for maintenance activities. The IWCP process is integrated with the procurement system that ensures proper parts, materials, and services are available when needed.

Elements of the Procurement and Engineering Programs require that only materials of the proper quality are installed in safety SSCs. Those materials are obtained through authorized procurement processes.

Maintenance organizations are responsible for obtaining receipt inspection, storage, and installation of quality level parts when required. Installation is documented using IWCP work packages.

Training and Qualifications

An adequate number of maintenance personnel must be available to promptly respond to equipment failures and to conduct routine maintenance and surveillances as necessary to remain compliant with AB and other governing documents. Site management involvement ensures maintenance and D&D crafts receive the proper training to keep current with new requirements and to perform special functions or procedures. Additional training is provided to the craftsmen to ensure they are knowledgeable of hazardous chemicals, radioactive materials, and energized or pressurized equipment that may present hazards during performance of work. Enhanced training specific to a craftsman classification may include welding, HVAC, and back flow prevention certifications. Specialized training, specific to the Site's mission work, is provided to assure maintenance crafts can safely perform hazardous work evolutions. This training includes, but is not limited to, Radiation Worker Training, Hazardous Waste Packaging, Asbestos and Lead Awareness, Lockout/Tagout, and facility indoctrinations.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs.

Operational configuration control relies on accurate interfacing between the TSM Program, COOP, and facility operations. The TSM Program's processes ensure that equipment will be able to function as described in the AB documents by performing the correct testing, surveillances, and maintenance for the equipment. These processes also ensure that the equipment will be restored to the proper operating configuration when it is returned to service after testing, surveillance and/or maintenance. Changes made to equipment or replacement of parts are governed by Engineering, IWCP and procurement programs.

6.15.4 References

DOE, 1992 — *Conduct of Operations for DOE Facilities,* DOE Order 5480.19, U.S. Department of Energy, Washington, D.C., May 18, 1992.

DOE, 1994 — *Maintenance Management Program,* DOE Order 4330.4B, U.S. Department of Energy, Washington, D.C., February 10, 1994.

DOE, 1998 — *Life Cycle Asset Management Program* DOE Order 430.1A, U.S. Department of Energy, Washington, D.C., October 14, 1998.

DOE, 2000 — DOE, RFFO letter to R. G. Card, K-H President, "Rocky Flats Field Office Commitment to DOE Order 430.1A Interpretation," AME:ESD:MH.00-01072, Department of Energy, Rocky Flats Field Office, January 27, 2000.

RFETS, 1999 — *Preventive Maintenance Program Plan,* 99-SSSO&I-PMPP-001, Rocky Flats Environmental Technology Site, Golden, CO, December 30, 1999.

RFETS, 2000a — *Site Maintenance Management Program Manual,* MAN-104-SMMP, Revision 0, Rocky Flats Environmental Technology Site, Golden, CO, May 30, 2000.

RFETS, 2000b — *Integrated Work Control Program Manual,* MAN-071-IWCP, Revision 3, Rocky Flats Environmental Technology Site, Golden, CO, October 30, 2000.

RFETS, 2000c — *Site Conduct of Operations Manual,* MAN-066-COOP, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, October 30, 2000.

6.16 TRAINING

The objective of the Training Program is to provide trained personnel to perform work in a safe, efficient and environmentally sound manner. The program is designed to ensure personnel are properly trained to perform specific job assignments.

6.16.1 General Program Description

The mission of the Training Program is to provide trained personnel able to operate and maintain equipment and processes, or supervise activities at the Site in a safe, efficient, and environmentally sound manner. A result of the Training Program is that appropriate collective knowledge of technical, safety, operational, and environmental professionals is transferred to the worker for the performance of activities. Workers are trained to (a) accomplish assigned tasks, (b) be knowledgeable of hazards, and (c) be capable of responding properly to upset conditions. The precepts of a trained and qualified workforce, conducting all activities in accordance with approved procedures, policies, and programs, are prerequisites for implementing the SMPs.

DOE Order 5480.20A, *Personnel Selection, Qualification, Training, and Staffing Requirements for DOE Nuclear Facilities* [DOE, 1994b], is the foundation for the Site Training Program for personnel identified in the DOE order who work in or support the nuclear facilities. Within the D&D Projects, the bases for their Training Program is a combination of OSHA, RCRA, and CERCLA requirements. The primary requirements for training and qualification activities at the Site are contained in these key CFRs and DOE orders, as well as others, and implemented via the *Training Program Manual* [RFETS, 2000].

- 10 CFR 830.120, *Quality Assurance* [CFR, 2000a]
- 10 CFR 835, *Occupational Radiation Protection* [CFR, 2000b]
- DOE Order 4330.4B, *Maintenance Management Program* [DOE, 1994a]
- DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities* [DOE, 1992]

The Training organization interfaces with all the other SMPs, as appropriate, to ensure the appropriate training is provided at the Site. For example, training personnel interface with nuclear safety personnel to develop courses for the implementation of new and revised AB documents. Training courses are also used to communicate practical understanding of the requirements of the OS&IH Program. The safety and health training provided at the Site ensures that employees understand the hazards to which they may be exposed, and supervisors and managers understand their responsibilities for communicating and training employees on workplace hazards. Training concerning chemical hazards (e.g., hazardous chemicals, carcinogens, compressed gases, and toxic chemicals), physical hazards (e.g., lockout/tagout, noise, and forklifts), biological hazards

(e.g., bloodborne pathogens), and ergonomic hazards are examples of the comprehensive OS&IH training effort provided at the Site.

6.16.2 Authorization Bases Importance

A fundamental precept inherent to performing nuclear work safely is that the work force is trained and qualified. This requires that the Site has a program that identifies and develops the training required to do the work; that individuals receive the training necessary to accomplish the task to which they are assigned; that work is performed only by personnel trained and qualified; and that training is revised or developed based on observed needs.

Training provided to the work force is based on analysis of the tasks to be performed and/or regulatory requirements. The Systematic Approach to Training (SAT) process has proven to be effective, is prescribed by DOE and used at the Site.

Once the specific training is identified and developed for each task or position, individuals are selected, trained and qualified to perform these tasks or fill these positions. Training and qualification is accomplished through a process that is contained in the *Training Program Manual* and supporting documentation. Re-qualification occurs and continuing training is provided when appropriate to ensure workers maintain the necessary level of proficiency to safely and efficiently accomplish work.

To ensure only trained and qualified individuals are assigned to perform tasks or fill positions, each Site nuclear facility and some departments maintain a List of Qualified Individuals (LOQI). Furthermore, it is the responsibility of supervisors to assign only qualified individuals to perform work and the responsibility of the individual to only perform work for which he or she is qualified.

The final attribute of an effective site training program is a process that enables the training program to respond to the changing needs of the Site. Feedback from students and supervisors, assessments, lessons learned and new tasks are evaluated and training revised or developed as appropriate.

6.16.3 Programmatic Key Elements

The following are key elements of the Training Program. These key elements, which are discussed in more detail in the following subsections, enable the Site to execute an effective initial and continuing training program. Specific details of the Training Program are found in the *Training Program Manual.*

- Organization and Administration
- Development and Implementation of Training
- Training Effectiveness

- Instructor Qualifications
- Document Management
- Configuration Management

Organization and Administration

The K-H President is ultimately responsible for the Training Program and delegates its implementation and administration through the EES&QP and its Training Department. The Training Program Manager has overall responsibility for the Site training and qualification program. The manager is responsible for developing and maintaining Site training and qualification policies, procedures, and practices in accordance with regulatory requirements and best business practices. The manager also ensures that training and qualification support is provided to the Site Projects for functions and programs that crosscut certain qualifications such as Configuration Control Authority, Waste Generator, and D&D workers. The Training Department also maintains the Training, Scheduling, and Records System.

Within the major Site Projects and certain facilities and/or departments is a Project-specific training organization that is directly responsible to the Site Project, facility, or department Manager for the training and qualification of Site Project, facility, or department personnel. These Site Project organizations ensure (a) adequate staffing and funding is available to support necessary training and qualification within the Site Project, facility, or department; (b) use cognizant SMEs to assist in the development and delivery of training; and (c) appoint qualification authorities who qualify and disqualify personnel for the Site Project, facility, or department.

Site Project and/or facility managers approve the Project-specific Training Implementation Matrix (Appendix 2 and 3), which defines and describes the application of the selection, qualification, certification, and training requirements from DOE Order 5480.20A. The Training Implementation Matrix clearly defines the organization, planning, and administration of the qualification program and sets forth the responsibility, authority, and methods for conducting training. Each facility has a written summary of positions requiring qualification or certification for the facility. The Training Implementation Matrices are submitted to the Training Program Manager for concurrence and then sent to DOE, RFFO for approval. On an annual basis, responsible Site Project and/or facility training personnel review each Training Implementation Matrix and revise as needed. During the review, the current facility classification and existing risks are recognized and considered.

Furthermore, to ensure that only trained and qualified individuals are assigned to perform tasks or fill positions, each Site nuclear facility and some departments maintain a List of Qualified Individuals. It is the responsibility of supervisors to assign only qualified individuals to perform work. Individuals only perform work for which they are qualified.

Development and Implementation of Training

Training provided to the work force is based on analysis of the tasks to be performed and regulatory requirements. The Systematic Approach to Training process has proven to be effective, is prescribed by DOE and used at the Site. This process includes these five phases: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation and is described in the *Training Program Manual.*

Training Effectiveness

Line management and the Training Program Manager evaluate the effectiveness of Site training. Formal processes are defined and conducted to evaluate the trainees' mastery of learning objectives during training, performance of trained personnel on the job (based on feedback from line management), and the instructors ability to provide training that is technically accurate and meets the needs of the students and the goals of the facility.

Instructor Qualifications

In the Site Training organization, instructors are qualified in accordance with the applicable regulatory requirements. These instructors possess knowledge and skills in the subjects being taught, at or above the level to be achieved by the trainee, as evidenced by documented training, education, and experience. This is best achieved when instructors come from line functions or possess significant related experience.

Every instructor has an active Instructor File maintained in the Site Training, Scheduling, and Records System. The file includes evidence of completed instructor training, and a letter from the instructor's supervisor or Training Program Manager detailing the courses the instructor is qualified to teach. Instructional staff members shall be qualified before being assigned instructional duties. An unqualified person may perform instruction under observation of a qualified instructor.

The OJT instructors have current credentials applicable to the process or skill for which they perform training in accordance with the *Training Program Manual* [RFETS, 2000]. Operators and SMEs, who are not qualified OJT instructors, may conduct training under direct observation of a qualified OJT instructor.

Management may grant instructional qualification based on credit for training or experience. Written documentation shall justify that the instructor has obtained the required knowledge and skills as evidenced by verifiable training, education, or past professional experience. Documentation may include transcripts, course certificates, and training histories from other DOE sites.

Document Management

The Training Program uses various types of documents to accomplish employee training and maintain a record of the training. These document types include instructor

guides, student guides, examinations, qualification/certification packages and rosters. These document types are managed as specified in the *Training Program Manual.*

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. Training developers ensure technically accurate training materials by requiring the SME, Program Owner, and Course Coordinator to provide appropriate input and reviews. Changes to training are initiated using the "Training Materials Transfer Form" and "Course Listing Change Request". All changes are reviewed and approved by the responsible manager. Completed course materials are maintained on file in the Site Training, Scheduling, and Records System. All classroom materials, including examinations and answer sheets, are identified by unique course numbers so that they can be filed and distributed efficiently, and instructors can be assured of the latest version.

6.16.4 References

CFR, 2000a — *Quality Assurance,* 10 CFR 830.120, Code of Federal Regulations, Office of the Federal Register, January 2000.

CFR, 2000b — *Occupational Radiation Protection,* 10 CFR 835, Code of Federal Regulations, Office of the Federal Register, January 2000.

DOE, 1992 — *Conduct of Operations Requirements for DOE Facilities,* DOE Order 5480.19, U.S. Department of Energy, Washington, D.C., May 18, 1992.

DOE, 1994a — *Maintenance Management Program,* DOE Order 4330.4B, U.S. Department of Energy, Washington, D.C., February 10, 1994.

DOE, 1994b — *Personnel Selection, Qualification, Training, and Staffing Requirements for DOE Nuclear Facilities,* DOE Order 5480.20A, U.S. Department of Energy, Washington, D.C., November 15, 2000.

RFETS, 2000 — *Training Program Manual,* MAN-094-TMP, Rocky Flats Environmental Technology Site, Golden, CO, September 18, 2000.

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6.17 TRANSPORTATION SAFETY

The Transportation Safety Program establishes the programmatic responsibilities and requirements to safely conduct transportation activities within the Site boundary. These requirements are consistent and compliant with DOE Transportation Safety Policies, transportation orders, applicable Federal regulations, and other Site programmatic requirements. These requirements apply to Site personnel performing transportation-related activities, which include on-Site transfer or off-Site shipment of radioactive and other hazardous materials, including preparations for transfer/shipment (e.g., packaging, marking, and labeling), vehicle readiness and operation, and operator qualification and training. The Transportation Safety Program is addressed only at the Site-level and, therefore, will not be included in the SMP chapter of facility-specific AB documents.

6.17.1 General Program Description

Transportation of classified, hazardous and/or radioactive materials is performed in accordance with established procedures and guidelines based on CFR Title 10, Part 71, *Packaging and Transportation of Radioactive Material* [CFR, 2000a]; Title 29, *Labor* [CFR, 2000b]; Title 40, *Protection of the Environment* [CFR, 2000c]; Title 41, *Public Contracts and Property Management* [CFR, 2000d]; and Title 49, *Transportation* [CFR, 2000e]. Title 49 contains regulations for the identification, packaging, labeling, placarding and shipping of materials via all modes of transportation.

Responsibilities delegated to the State of Colorado for off-Site shipments are codified in Title 8 of the Colorado Code of Regulations. The Colorado State Patrol administers this function under 8 CCR 1507-1 [CCR, 1996]. Each operator of a vehicle transporting hazardous materials in the State of Colorado (a) must obtain a permit stating the material to be carried, (b) is subject to safety inspections at 3-month intervals, (c) must comply with safety standards (including driver training) and specifications for the operation of commercial vehicles, and (d) is required to notify the Colorado State Patrol of incidents and accidents concerning the cargo. Regulations for transportation of hazardous waste materials are contained in 6 CCR 1007-3 [CCR, 1990] and CFR Title 49.

The *Site Transportation Safety Manual* [RFETS, 2001] is the requirements document for the Transportation Safety Program. The specific DOE orders that form the bases for the requirements are listed and discussed in the *Site Transportation Safety Manual*. Work control documents (e.g., procedures and operations orders) that implement the *Site Transportation Safety Manual* requirements are developed, maintained, and controlled by the Traffic and Transportation Department.

Transportation-related activities performed within the Site boundary, which support on-Site transfers and off-Site shipments of radioactive and other hazardous materials as defined in the applicable DOE Orders, are subject to the provisions of the

Site Transportation Safety Manual. Site contractors, subcontractors, and vendors performing transportation-related activities are required to follow the applicable provisions of the *Site Transportation Safety Manual.* In addition, the Site SAR [RFETS, 2000c] defines specific controls for on-Site transfers of radioactive or hazardous materials that are implemented through Site procedures and documents.

The WIPP requirements that impact transportation activities are defined in the Waste Management Program (see Section 6.18) and are implemented by waste management procedures. Transfers of non-hazardous materials will be accomplished using efficient industrial practices subject to the requirements of the IWCP that include the key functions and principles of ISM.

6.17.2 Authorization Bases Importance

The important nuclear safety attributes of the Transportation Safety Program focus on maintaining safe transport of the radioactive or hazardous material that is being transferred on Site during normal operations or upset conditions. This is accomplished by the following attributes: (1) identifying transportation requirements for specific packaging configurations that contain different types of material as defined in the *Site Transportation Safety Manual*, Chapters 8 and 9, (2) ensuring the transfer vehicles are maintained (*Site Transportation Safety Manual*, Chapter 13), and (3) providing qualified vehicle operators to perform on-Site transfers (*Site Transportation Safety Manual*, Chapter 10). The Waste Management Program (see Section 6.18) is responsible for implementing the transportation-related packaging requirements along with any other waste-related packaging requirements in the waste management implementing procedures.

The Site SAR contains the identified hazards, assumptions, and controls based on a nuclear safety analysis of on-Site transfer activities. The Site SAR controls for on-Site transfers must be complied with and implemented to ensure on-Site transfers are performed safely. The controls in the Site SAR do not apply to off-Site shipments that are governed by transportation requirements identified in the *Site Transportation Safety Manual* and implemented in separate procedures. Implementation of the requirements in the *Site Transportation Safety Manual* and the controls in the Site SAR form the basis of the Transportation Safety Program.

DOE orders implement and regulate off-Site shipment and on-Site transfers of hazardous and radioactive materials and establish the standards to be followed. Route designation and safety requirements for equipment and drivers have the effect of reducing the accident rate. Requirements for manifests, marking, and placarding of packages and vehicles help to reduce the consequences of such accidents by helping emergency workers to quickly identify the contents of a damaged shipment so that appropriate actions can be taken.

6.17.3 Programmatic Key Elements

The following key elements categorize the major areas of the Transportation Safety Program as they relate to AB accident analyses for transportation-related activities. The topics within these key elements are discussed in more detail in the following subsections.

- Organization and Administration
- Packaging, Marking, and Labeling
- Transfer Vehicle Readiness and Operation
- Training and Qualifications
- Configuration Management

Organization and Administration

The K-H President is responsible for the Transportation Safety Program and delegates its implementation and administration through the MS Project to the Traffic and Transportation Manager. The Traffic and Transportation Department is organized into three parts: Transportation Operations, Transportation Planning, and Technical Support. Specific responsibilities are defined in the *Site Transportation Safety Manual* and summarized as an overview in the following paragraphs.

The Traffic and Transportation Manager provides management, integration, oversight, technical analysis, and leadership in planning, organizing, directing, and controlling transportation-related activities. He assures that the Traffic and Transportation Department resources are safely and effectively utilized in conducting transportation operations in accordance with applicable regulations, orders, policies, manuals, and procedures. The Traffic and Transportation Manager is responsible for the management, maintenance, and operation of the government vehicle fleet at the Site. He coordinates and executes transportation-related activities that support on-Site transfers and off-Site shipments. He has responsibility for regulatory compliance, procedure compliance, activity oversight, and program review for activities that impact packaging, shipping, and transportation. He has signature approval authority for those procedures, activities and programs that impact packaging, shipping, and transportation.

The Traffic and Transportation Department provides SMEs and administers the regulatory requirements of transportation operations within the Site boundary. They assess programmatic performance of the transportation activities across the Site and adjust transportation operations, as necessary, to ensure performance is consistent with Site mission objectives. They coordinate with the Site Projects to set strategic policy with respect to the transportation requirements to support Site closure and set the programmatic direction to implement the strategic policy.

The Traffic and Transportation Department maintains effective and credible relationships with internal and external customers. They also maintain and administer the Site SAR. This responsibility entails ensuring compliance through oversight of Site SAR implementing procedures, performing compliance assessments, tracking and trending Site SAR deviations, administration and implementation of technical updates, compliance reporting, and personnel training to ensure effective and efficient compliance with Site SAR controls. This Technical Support organization works with Site Projects and SMP Owners to ensure that the Site SAR controls are current and are commensurate with the risks presented by closure activities.

Within the Transportation Operations Department, the Traffic Management Group prepares off-Site shipping documents and records the types and quantities of hazardous materials for inbound and outbound shipments. This information is summarized by hazard class and maintained by DOE in the Enterprise Transportation Analysis System, which is DOE's unclassified, computer-based historical transportation information system. Materials (including bulk chemicals) that are purchased by subcontractors and used by them on Site as part of their contracts are not subject to this accounting system.

The *Site Transportation Quality Assurance Program Plan* [RFETS, 2000a] has been developed to ensure that activities involving packaging, shipping, and transportation of materials are accomplished in accordance with the appropriate Federal, State, and local regulatory agencies. The requirements of the plan provide those responsible with adequate means of control and verification for ensuring that operations are completed in a safe, secure, and environmentally sound manner. Emphasis is placed on those activities that protect the general public, the environment, and Site employees. Examples of quality assurance activities include periodic spot surveys of transportation operations and using checklists to survey the work practices. Audits are used periodically to verify activities regarding on-Site packaging and transportation. Areas covered, as a minimum, include training, packaging, marking, labeling, transportation, radiological operations, records, and shipping/transfer and receiving activities (logistics).

Packaging, Marking, and Labeling

The *Site Transportation Safety Manual* requires that all radioactive material, hazardous materials, hazardous substances, and hazardous waste be packaged, labeled, marked, handled, and transported in approved packages, using methods and procedures that will assure compliance with all applicable Site requirements and government regulations. Other off-Site shipping requirements are defined in the Waste Management Program (Section 6.18). The Transportation Safety and Waste Management Programs requirements related to packaging are implemented by the facilities using Waste Management implementing documents. Packaging is performed within the facility boundaries before the package is released for shipping.

The *Site Transportation Safety Manual* lists the packaging configurations approved for on-Site use. Each packaging configuration listed has been reviewed and approved for its intended use. Packages used for the on-Site transfer of radioactive

materials in excess of Type A quantities must be able to withstand a four-foot drop test without loss of contents and must meet the Title 49 CFR requirements for conditions normally incident to transport. The potential exceptions to this requirement are packages pre-approved for on-Site use in the *Site Transportation Safety Manual*, Appendix 8 (most meet requirement, but not all), excepted packages identified in 49 CFR, and packages approved as non-routine transfers meeting *Site Transportation Safety Manual*, Chapter IX requirements. Packages for radioactive materials also must meet the general package requirements in the applicable Title 49 CFR sections. Pre-approved packaging configurations provide assurance that the transportation requirements are met and reduces the potential for a release of the contents within the package (prevention control versus mitigation).

The use of nonstandard transfers or packages (e.g., oversize wooden crates or drums of liquid) which do not meet the stated requirements in the *Site Transportation Safety Manual* may be allowed as long as the "Non-Routine Transfer" process in Chapter IX is followed. This process requires development of an IWCP work control document, nuclear safety evaluation, and transportation equivalency review and approval. This process provides assurance that the appropriate level of controls are defined and implemented for the non-routine transfer or package.

Transfer Vehicle Readiness and Operation

There are over 400 government owned or leased vehicles on Site, ranging from forklifts and golf carts to flatbed trucks and backhoes. Commercial tractor-trailers are used for off-Site shipment of low-level, mixed and hazardous waste. Drums are transported in enclosed metal vans or trailers, but crates may be transferred between buildings on flatbed trucks. The Transportation Operations Group within the Traffic and Transportation Department is responsible to ensure that all these vehicles are maintained and repaired, as needed, to meet DOE and DOT requirements. This will ensure that these vehicles are ready to operate when needed and reliably perform their intended function. In addition as part of vehicle readiness and operation, the drivers control the presence of combustible and flammable materials in or near the transfer vehicle while driving and at the dock. As a result, the initiation of accidents is reduced (lower accident frequency) and the potential consequences are minimized.

The SNM is shipped off Site in Safe Secure Trailers (SSTs) or Safeguards Transporters (SGTs), which are specially constructed tractor trailers designed to deny unauthorized access. These SSTs/SGTs are specially scheduled, routed and escorted. Only DOE Transportation Safeguards Division employees are drivers for SSTs/SGTs. These drivers require special training, above and beyond normal training for hazardous materials transporters. Packages are loaded and secured so that they will remain in place during accident conditions.

Some radioactive materials, in small quantities such as air samples (in packages) or the encapsulated or electroplated sources integral to some instruments, may be hand-carried outside a building. Requirements for hand carry are in *Site Transportation Safety Manual*. Radioactive materials not meeting the DOT definition of Radioactive per

Title 49 CFR are managed and transported on Site in accordance with DOE and the *Site Radiological Control Manual* [RFETS, 2000b].

Training and Qualifications

The Traffic and Transportation Manager identifies and approves the training requirements for all personnel within the department based on transportation and Site regulations. These training requirements are tailored to the job description and function of each individual. For example, truck drivers require DOT training and if they require access to radiological areas they require radiological worker training. In addition, there are minimum training requirements for everyone in the department. A List of Qualified Individuals is also maintained and controlled by the Traffic and Transportation Manager. The Training Program (Section 6.16) provides the general training and qualification requirements for the Traffic and Transportation Department.

There are also special qualification requirements for individuals in certain positions within the Traffic and Transportation Department. Examples of special qualifications include Commercial Vehicle Safety Inspection, Motor Carrier Safety Awareness, CSOs as defined in the Criticality Safety Program, and Qualified Evaluators (QEVs) as defined in the Nuclear Safety Program. Having trained and qualified individuals performing transportation-related activities minimizes the possibility of human errors (prevention control) and reduces the accident rate for vehicle collisions.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. The Transportation Safety Program is integral to Sitewide configuration control with respect to on-Site transfers and off-Site shipments of radioactive and other hazardous materials. The Transportation Safety Program governs the processes used to move radioactive materials on and off Site. Shipping facilities are responsible for providing accurate information about the materials being transferred between on-Site facilities or to off-Site receiver facilities. This information accompanies the material during transfer or transportation and is verified by the receiving facility. The information is also entered into the appropriate databases, which maintain current information such as location, content, and packaging.

6.17.4 References

CCR, 1990 — *Hazardous Waste*, 6 CCR 1007-3, Colorado Code of Regulations, 1990.

CCR, 1996 — *Rules and Regulations Concerning Minimum Standards for the Operation of Commercial Vehicles*, 8 CCR 1507-1, Colorado Code of Regulations, Denver, CO, December 12, 1996.

CFR, 2000a — *Packaging and Transportation of Radioactive Material,* CFR Title 10, Part 71, Code of Federal Regulations, Office of the Federal Register, January 1, 2000.

CFR, 2000b — *Labor,* CFR Title 29, Code of Federal Regulations, Office of the Federal Register, July 1, 2000.

CFR, 2000c — *Protection of the Environment,* CFR Title 40, Code of Federal Regulations, Office of the Federal Register, July 1, 2000.

CFR, 2000d — *Public Contracts and Property Management,* CFR Title 41, Code of Federal Regulations, Office of the Federal Register, July 1, 2000.

CFR, 2000e — *Transportation,* CFR Title 49, Code of Federal Regulations, Office of the Federal Register, October 1, 2000.

RFETS, 2000a — *Site Transportation Quality Assurance Plan,* T-92-Traffic-101, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, March 2, 2000.

RFETS, 2000b — *Site Radiological Control Manual,* MAN-102-SRCM, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, October 15, 2000.

RFETS, 2000c — *Rocky Flats Environmental Technology Site Safety Analysis Report,* Revision 2, Rocky Flats Environmental Technology Site, Golden, CO, November 2000.

RFETS, 2001 — *Site Transportation Safety Manual,* MAN-T91-STSM-001, Revision 1, Rocky Flats Environmental Technology Site, Golden, CO, February 12, 2001.

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6.18 WASTE MANAGEMENT

The Waste Management Program establishes the Site processes to generate, characterize, package, and control hazardous, radioactive and mixed waste. The program identifies the requirements to be followed to ensure non-radioactive hazardous, radioactive, and mixed waste from the Site meets disposal sites' WAC and, while wastes are on Site, they are managed in compliance with applicable regulations.

6.18.1 General Program Description

Both Federal and State regulations contain requirements that are implemented through the Waste Management Program. The majority of requirements applicable to RFETS waste come from DOE Order 435.1, *Radioactive Waste Management* [DOE, 1999], RCRA, and WAC for disposal sites. The *Transuranic Waste Management Manual* [RFETS, 2000], *Low-Level/Low-Level Mixed Waste Management Plan* [RFETS, 1999a], and *RCRA Permit* [RFETS, 1997] are the primary documents identifying requirements and controls for Waste Management Program activities.

The *Transuranic Waste Management Manual* and the *Transuranic Waste Characterization Program Quality Assurance Project Plan* [RFETS, 1999b] describe how requirements to ship waste to WIPP are met and provides some of the Site-specific program documents. The flowdown of the WIPP requirements from the DOE, Carlsbad Area Office start with various State and Federal regulations including radiation standards, packaging, transportation, quality assurance, and hazard management.

The *Low-Level/Low-Level Mixed Waste Management Plan* details the Site's implementation strategy for the management of low-level waste (LLW) and low-level mixed waste (LLM) generated at the Site. Adherence to this waste management plan ensures that wastes are properly generated, characterized, handled, packaged, stored, and certified to meet the WAC for disposal at an approved facility. As with the requirements for the Transuranic (TRU) waste, the basis for the LLW and LLM requirements come from various Federal and State regulations related to packaging, transportation, quality assurance, and hazard management.

6.18.2 Authorization Bases Importance

The important nuclear safety attributes of the Waste Management Program focus on (a) ensuring waste generation, characterization, packaging, transportation, storage, and disposal are performed in accordance with State and Federal regulations, (b) controlling configuration, location, and quantities of hazardous, radioactive, and mixed wastes, (c) maintaining a current, documented inventory of the various wastes at the Site, (d) performing routine surveillances, inspections, and monitoring of compliance with regulations, (e) ensuring waste container integrity and (f) managing combustible gas build-up in waste packages through identification of packaging configurations including venting, as applicable.

6.18.3 Programmatic Key Elements

The following key elements categorize the major areas of the Waste Management Program as they relate to AB accident analyses. The topics within these key elements are discussed in more detail in the following subsections.

- Organization and Administration
- Characterization
- Packaging
- Training and Qualifications
- Configuration Management

Organization and Administration

Accident analyses performed to support various Site and facility activities assume the Waste Management Program is effectively implemented at a Site level such that requirements from the program are identified and implemented consistently, as applicable. This implementation is often required to support the validity of initial conditions and inherent assumptions used in the accident analyses. Therefore, the K-H President is ultimately responsible for the Waste Management Program and delegates its implementation and administration through the MS Project to the managers of the Low Level and Other Waste Project and TRU Waste Project. These two Project Managers establish and maintain the Waste Management Program requirements and manuals.

To assure requirements are implemented consistently and appropriately throughout the Site Projects, MS organizations and personnel are responsible for implementation of Waste Management Program requirements throughout the Site. The MS's Engineering, Environmental, Safety, and Quality; Measurements; and Technical Operations organizations provide the various Site Projects with support and services for sampling, characterization, shipping, databases, procedures, and RCRA custodians. Additionally, Site Projects are assigned a designated MS point of contact, as necessary.

The Waste Certification Officer function is maintained independent of the MS organization and resides in the EES&QP organization. The Waste Certification Officer provides the final check of information and data prepared and maintained by MS.

Characterization

Characterization is controlled through certification and quality assurance requirements. This results in waste types and categories with known characteristics and individual containers with known radioactive and non-radioactive hazardous material content. The individual container content determines where and how the container can be managed and stored. Controls based on the radioactive material content are contained in

nuclear safety and criticality safety documents, as appropriate. Controls related to the non-radioactive hazardous materials are contained in the *RCRA Permit.*

Characterization of all wastes begins at the point of generation. The extent to which characterization is verified, certified, and documented is dependent on the type of waste involved and the intended disposal site. The TRU waste characterization usually includes lab analysis or assay to determine radioactive material content. Other methods for determining and documenting radioactive material content are available but must be approved on a case-by-case basis. Low-level waste is characterized through process knowledge, surveys, or laboratory analyses or assays, as appropriate. In this case, rigorous documentation of process knowledge for the waste stream is needed and packaging of waste is verified independently. Non-radioactive hazardous material characterization is performed both quantitatively and qualitatively dependent on specific requirements of Waste Disposal Sites, State of Colorado, and level of certainty of process knowledge. Documentation of characterization is largely stipulated by the intended disposal site and other quality assurance requirements.

Packaging

Approved packaging requirements for wastes are based on both the radioactive and hazardous material content. The most robust packaging is required for TRU waste with lesser packaging being considered adequate for LLW. For non-radioactive hazardous waste, the packaging is dependent on the intended disposal location and characteristics of the material such as corrosiveness and flammability. Compliance with packaging requirements is the responsibility of the waste generator and shipping facility. Prior to using a specific type of packaging the waste generator must ensure it is the proper type for the waste being packaged. Furthermore, when a container is ready to be transferred or shipped, the shipping facility must verify that the proper container has been used and that the container will maintain its configuration while in transport. Any container configuration issue that arises during transfer or shipment is the responsibility of the shipping facility.

Packaging configurations in the *Transuranic Waste Management Manual* are based on WIPP WAC and TRUPACT II requirements. Many of the TRUPACT II interior packaging configuration requirements have become the RFETS-approved packages for on-Site transfer of materials. Packaging for LLW is primarily determined by DOT requirements for off-Site shipment. There are limited LLW packaging configurations, most of which are associated with backlog waste, approved for on-Site transfers that do not meet DOT requirements.

Disposal site WAC for both LLW and TRU, as well as RCRA requirements, address assuring container integrity and other similar requirements related to the outer layer of packaging. The WIPP requirements have resulted in checklists, listing specific container characteristics, being used by the Site during waste handling and transfers. Containers managed under the RCRA requirements have an additional routine inspection performed and documented while containers are in storage. The *Low-Level/Low-Level Mixed Waste Management Plan* implements various container integrity requirements

including the length of time containers may be staged out of doors unprotected from the weather.

The WIPP WAC addresses the potential for flammable gas, particularly hydrogen and volatile organic compounds, in containers through multiple requirements. One requirement is the installation of filtered vents on 55-gallon drums and standard waste boxes. Since TRU waste is stored on Site for unspecified lengths of time pending shipment, the Site includes residues and TRU waste in a vent monitoring program. It is the responsibility of the TRU Waste Program to maintain the waste vent testing program and assure its execution.

Training and Qualifications

The importance of characterization documentation is very significant in the Waste Management Program. The Site relies on it to assure that waste generated can be classified and sent to a disposal site. The State of Colorado relies on it to assure that RCRA-hazards are identified and managed. The waste disposal sites rely on it to maintain compliance with their own operating permits/licenses. Therefore, the *Transuranic Waste Management Manual*, the *Low-Level/Low-Level Waste Management Plan*, and the *RCRA Permit* all stipulate various training and qualification requirements that must be met for personnel performing work within the Waste Management Program. The Waste Management Program is responsible for specifying the level of training and qualification required to perform various functions. Employees are responsible to keep their required training current. Training requirements and documentation are maintained per Site procedures.

Configuration Management

As discussed under the Configuration Management Program (Section 6.3), configuration management at the Site is an integration of various functions within specific SMPs. One of the major functions of the Site is waste management for waste that was generated during past production activities and waste generated during D&D of Site facilities, awaiting transportation to an off-site repository. As discussed above, proper packaging and storage of these wastes is relied upon in AB analyses. Therefore, the Waste Management Program interfaces with procurement to ensure proper packages are purchased for waste storage, with the Environmental Management Program to ensure packaging requirements are met and a permitted storage location is identified, and with the AB to ensure the hazards present have been properly analyzed and controlled. The Waste Management Program also oversees the processes for correct loading of waste storage packages, which is typically relied upon to support criticality incredibility analyses. Changes to waste packaging configurations are completed in accordance with Engineering and Document Management processes.

6.18.4 References

DOE, 1999 *Radioactive Waste Management*, DOE Order 435.1, U.S. Department of Energy, Washington, D.C., July 9, 1999.

RFETS, 1997 *RFETS Resource Conservation and Recovery Act Part B Permit* (No. 97-05-30-01), Rocky Flats Environmental Technology Site, Golden, CO, May 30, 1997.

RFETS, 1999a *Low-Level/Low-Level Mixed Waste Management Plan*, 94-RWP/EWQA-0014, Revision 2, Rocky Flats Environmental Technology Site, Golden, CO, November 1999.

RFETS, 1999b *TRU Waste Characterization Program Quality Assurance Project Plan*, 95-QAPJP-0050, Revision 4, Rocky Flats Environmental Technology Site, Golden, CO, December 9, 1999.

RFETS, 2000 *Transuranic Waste Management Manual*, 1-MAN-008-WM-001, Revision 4, Rocky Flats Environmental Technology Site, Golden, CO, June 2000.